The MINING CONGRESS JOURNAL

MARCH, 1932

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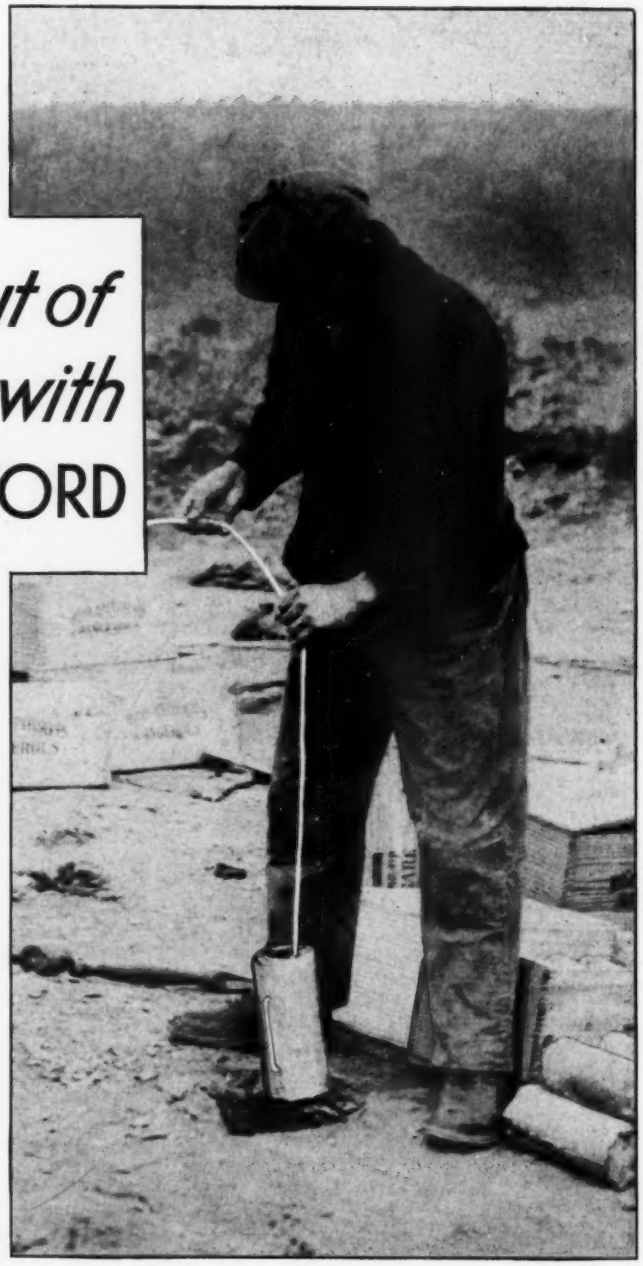
The Nation's Purse Strings *by J. F. Callbreath*
Accident Prevention Work *by L. M. Northcutt*
Improving Preparation and Washing *by C. V. Barrow*
Metal Mine Ventilation in 1931 *by D. Harrington*

Get more work out of your explosives with CORDEAU-BICKFORD



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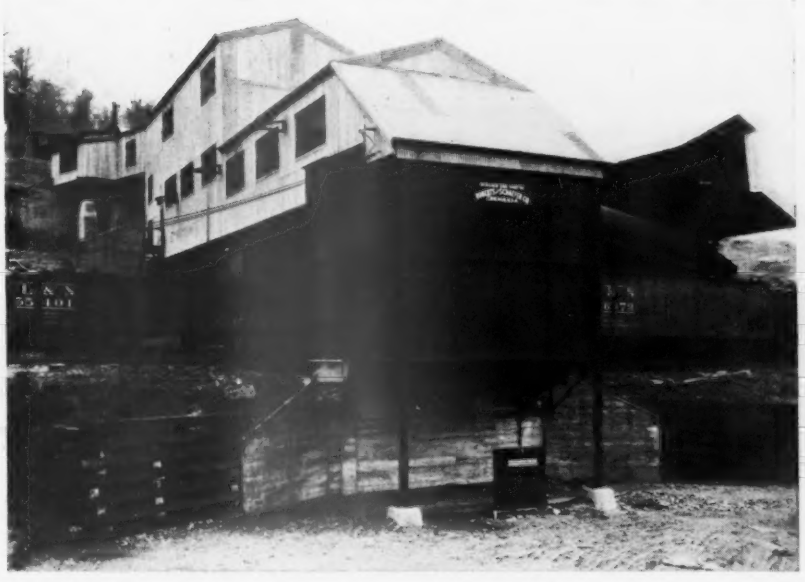

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THE MINING CONGRESS JOURNAL

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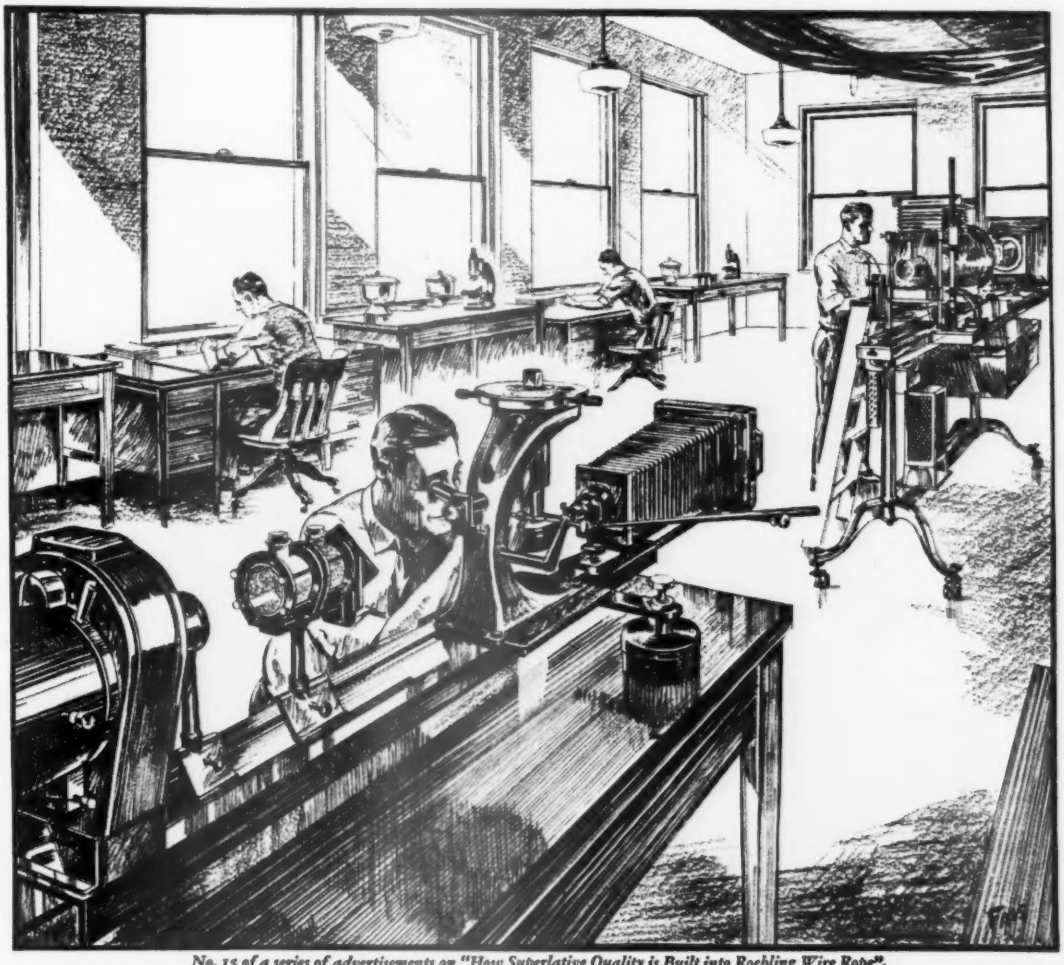

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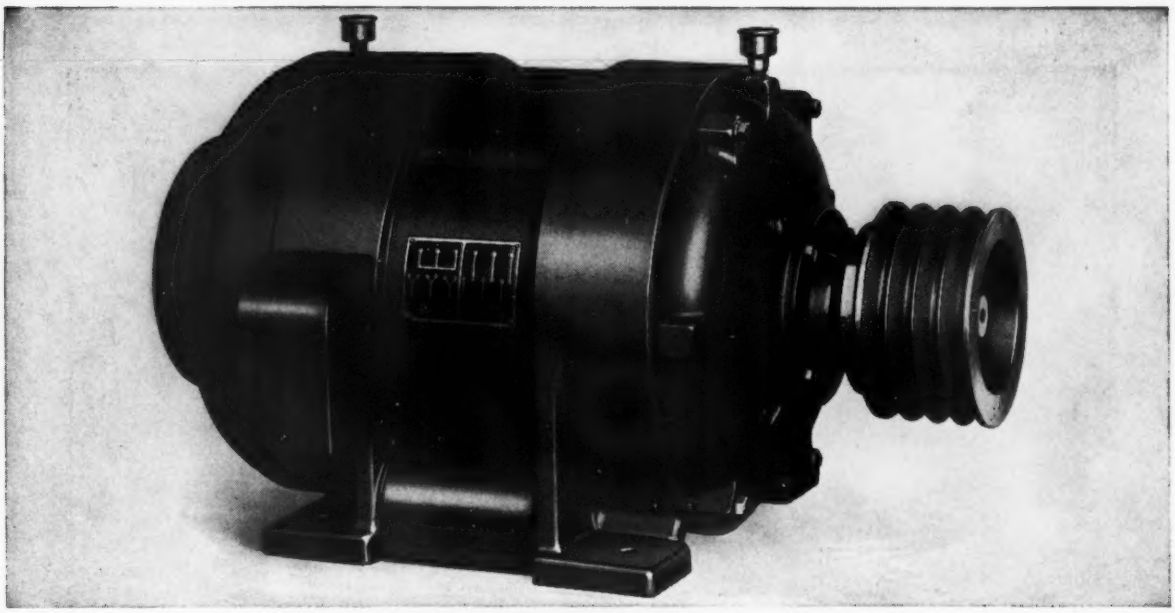

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HE knows that where dust, dirt, moisture, dripping water, or destructive gases are present . . . . those drives in out of the way places where motor windings become clogged or moisture soaked . . . . there, Allis-Chalmers enclosed fan-cooled motors reduce trouble and operating expense.

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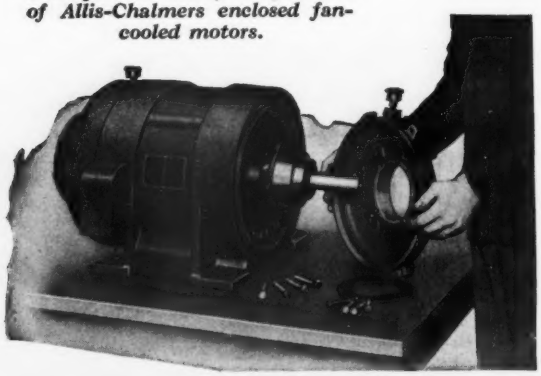

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Being light in weight it may easily be placed in the cradle support on the post and lifted to drilling height. A fast speed of 43 in. per minute forward and 216 in. per minute return greatly reduces drilling time. The rapid return speed of the auger without reducing direction of rotation cleans the holes of all cuttings.

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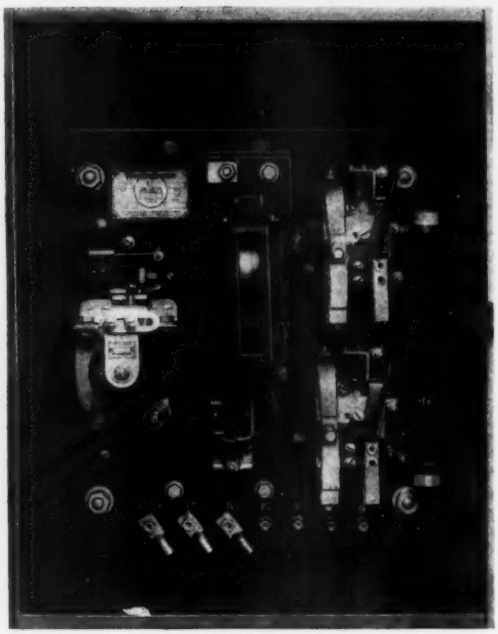
TURN RED TONNAGE

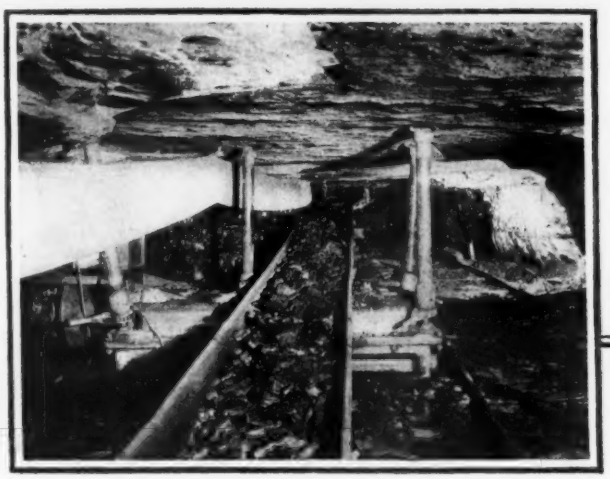
**Red tonnage—that portion of your production which goes to pay fixed and operating expenses. The remainder—Black Tonnage—is your profit.*

Right—The new Westinghouse Heavy Duty Time-starter (cover removed). It is protected from rock falls by a rugged, dust-proof, steel cabinet.

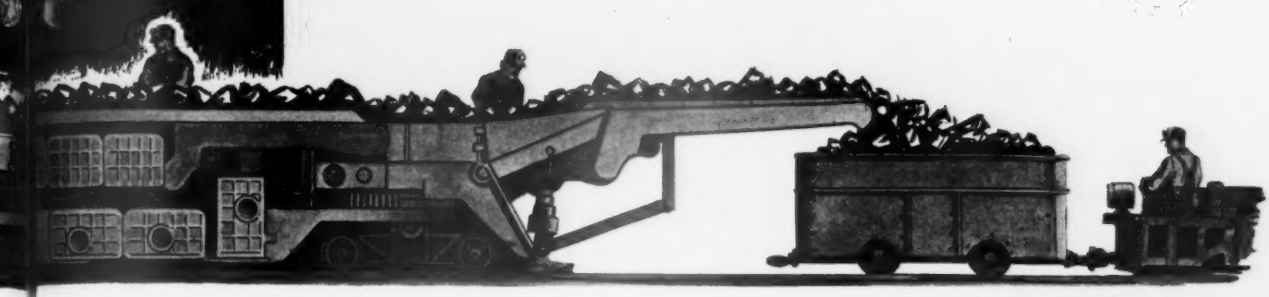


A Brown Fayro pit car loader driven by Westinghouse Type RH Explosion-tested Motor and Control.

Right—A COSCO shaker conveyor powered by Westinghouse SK Motor and Control.



▲▲TO BLACK▲▲▲



WITH
THE NEW TIMESTARTER

COOPERATING in the reduction of mining costs, Westinghouse introduces an improved magnetic starter . . . a worthy teammate for the dependable SK motor.

This new Westinghouse heavy-duty Timestarter (underground magnetic control) brings you the following exclusive advantages:

WEAR-PROOF CONTACTOR OPERATION

The new Westinghouse Cold-Arc Contactor has withstood more than 6,000,000 contactor operations under actual service load to prove that its arc box, shunt and bearings are wear-proof!

NO MORE IDLE MACHINES DUE TO LOW-VOLTAGE

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With these improvements to assist the industry's leading underground motor . . . the Westinghouse SK . . . you are assured a greater return on mechanization investments. Send us the coupon for complete information.

The new "Cold Arc" Contactor so quickly ruptures the arc that it will not scorch tissue paper held against its open arc box.

Left—The new Westinghouse Timestarters are available in explosion-tested types for use in gaseous areas.

Below—The Westinghouse Explosion-tested Type RH Motor for across-the-line starting.

Westinghouse

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Room 2-N—East Pittsburgh, Pa.

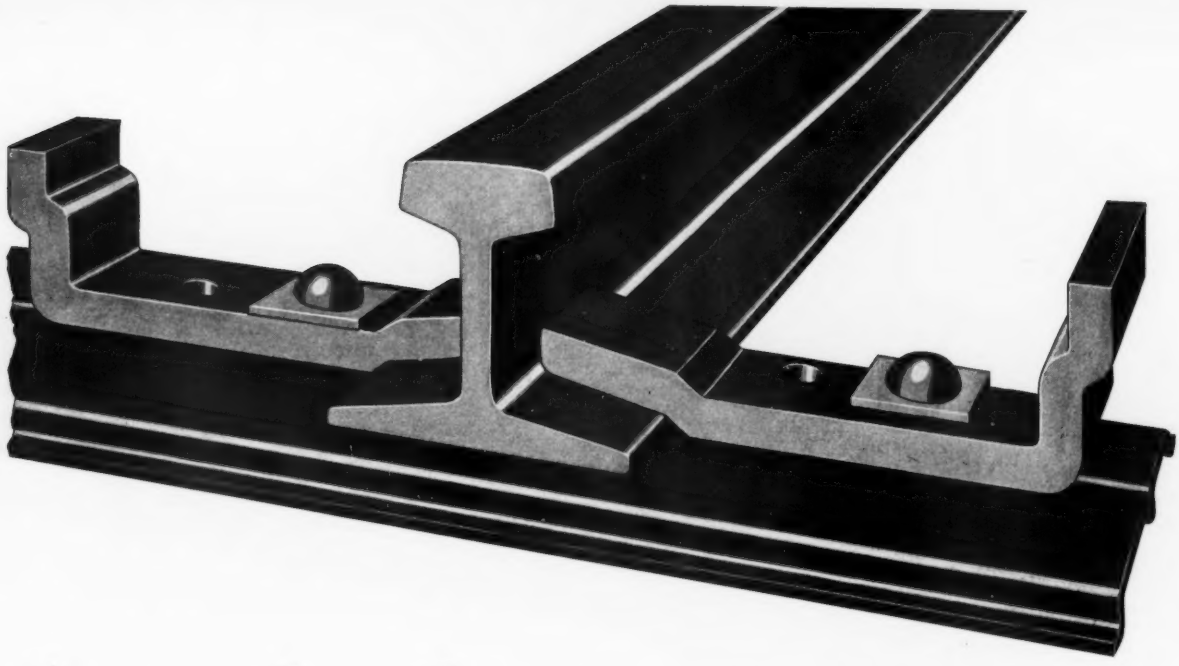
Gentlemen: Please send me complete information on the Class 8518 Timestarter.

Name.....

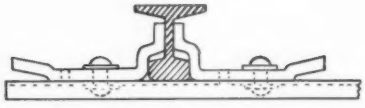
Company.....

Address.....

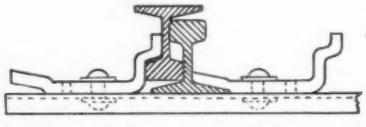
City.....*State*.....CA 3-32



A steel rail-extension tie for inverted or upright rails



Position of clips when rail is inverted



Position of clips when rail is upright and sliding extension rail is used

The Bethlehem Steel Rail Extension Tie greatly simplifies the laying of temporary track at the working face. The design of the clips provides for easy attachment to either upright or inverted rails and permits the use of slide rails as well. The clips are substantially made from rolled steel and riveted to the tie which is a rolled section weighing 3.24 lbs. per ft. These ties are made for any gage track and are complete units, having no extra parts to become lost or misplaced and requiring no special tools for installation. A blow or two with a hammer is all that is necessary to drive the clips into position.

Bethlehem Rail Extension Ties make better track and are a safeguard against derailment. They hold the track true to gage and in alignment and provide adequate support for track-type cutting and loading machines. Our nearest district office will gladly explain in further detail the advantages of these ties.

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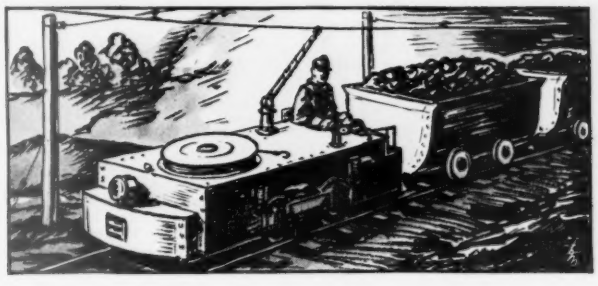

The tough woven jacket of Duracord *stays on* . . . it's cemented to the insulation. That's the big reason why Anaconda Duracord is the longest-life cable you can buy for gathering locomotive use. Service records prove it.

Inside the rugged cover...proof against rough treatment...the rubber insulation gets full protection. It cannot bulge and crack open. The cover can't slip on the cable. Every one of the usual causes of cable failure is checked. Duracord for endurance!

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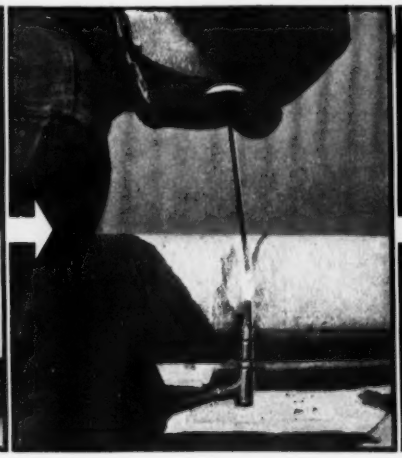

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THE MINING CONGRESS JOURNAL

A Journal for the entire mining industry
published by The American Mining Congress

The Nation's Purse Strings

THE GREATEST PROBLEM of the civilized world is money. In a general way we know what it is and how it functions. It seems to possess no problems. We know that those people who use it most have more of luxury and more of culture than those who barter with no set medium universally recognized as a measure of value. We know that when money is plenty in the hands of the public that business is prosperous, that the prudent and industrious add easily to their accumulations, and that happiness and independence are the rule.

The more rapidly this money changes owners, the more prosperous are those who handle it. The old rule still prevails as laid down by John Cobden, the English economist, that he who brings buyer and seller together for mutual profit is a public benefactor. The sum of these benefactions is prosperity. Money may be lost from one to another in unfair trade, but it still exists. Money that comes easily usually goes easily. The successful gambler does not hoard; he spends. The loss of a million dollars by Mr. Tightwad to Mr. Spendthrift may be a distinct benefit to the business community, because that million is kept actively at work in the channels of trade. But the moment the active money of the country is hoarded, business depression follows. Like a card house the financial structure topples, followed by the bankruptcy of debtors, unemployment and business stagnation.

We know the function of money but we do not comprehend just why a country like our own, with more money than it ever had before, with the largest gold stock of any nation in the world, should, in a few months, be transformed from a condition of its greatest prosperity to business wreckage, unemployment and despair.

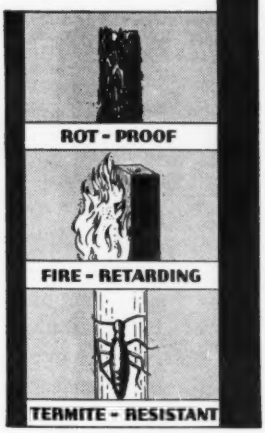
In March, 1893, the cashier of a bank in a small New York town, in explanation of the fact that creditors had failed to meet obligations for which they had usually borrowed, said that all indications pointed to a money stringency and that his bank was making no loans. "At this time," said he, "we have 75 percent of our deposits in the vault and by the time the crash comes we hope to increase to 90 percent." "No matter how many other banks fail," said he, "the National Union Bank will remain solvent." In July of that year came the crash which bankrupted thousands of banks, absorbed the equities from billions of investments and brought unemployment and poverty to millions of people. The example of the bank referred to, followed as it was by the banks of the country, in itself was enough to account for the terrible business depression of 1893.

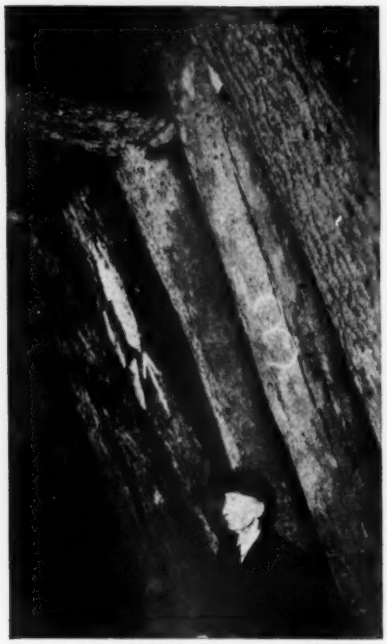
It is a common boast that business is done on credit—but the men who are adventurous, who develop business enterprises, who make employment for workmen, who supplement their own capital with borrowed money, the men who make prosperity are the men who lose their fortunes through the acts of "prudent" bankers who follow the course necessary to the protection of their depositors. The obvious question is "Are the purse strings of the Nation in proper hands?"

MINE TIMBERS IN SERVICE

more than 20 YEARS..

Records are obtainable showing timbers treated with Zinc Chloride in constant use over 20 years in the anthracite district in Pennsylvania – untreated timbers under identical conditions have required replacement in 3 to 6 years.





Timber Marked "2" was treated with Zinc Chloride and installed in 1908. An analysis of borings taken in September, 1931, shows three times more Zinc Chloride present than is necessary to keep fungus out.

No stronger argument can be made for the Zinc Chloride treatment of wood than its outstanding economy. Seventy-five years of experience and countless actual comparisons prove that Zinc Chloride-treated wood has many times the life of untreated timbers.

The Zinc Chloride treatment adds but little to the cost of natural wood, yet increases its value many times. It prolongs the life of the wood, eliminates the need of replacements, and reduces maintenance expense. Zinc Chloride-treated wood is rot-proof, termite resistant, and fire-retarding.

If you do not already treat your mine timbers, ties and structurals with Zinc Chloride, send at once for our booklet explaining the many advantages and outstanding economies of the Zinc Chloride method of wood preservation.

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The
MINING CONGRESS
JOURNAL

MARCH, 1932
VOLUME 18
NUMBER THREE

Editorials

Social Legislation

BETTER than disregard discussions arising in the matter of unemployment and unemployment insurance, we should frankly face, examine and consider them. Proposals to correct our present unemployment problems run all the way from the retraining of employes, dismissal of wage arrangement, to the creation of unemployment reserves and unemployment insurance.

At the Washington meeting of the American Association for Labor Legislation a mass of papers and discussion developed in which the line of thought is that through "American proposals" the present public fear be removed and trade be promoted. Papers and discussions very definitely presented the thought that employment reserves or unemployment insurance cannot be handled successfully by employers.

It apparently was the consensus of opinion that cost must be borne by the ultimate consumer, that the worker is not responsible for his unemployment, this being a problem of management. Serious thought must be given to developments in Wisconsin, where, after ten years of effort a law has just been passed establishing unemployment insurance for industry. Some of the outstanding details of this law make payments of benefits available as of June 1, 1933, out of funds built up by the separate companies with the state official depository at the rate of 2 percent of the payroll of the company. Out of the reserve thus created payments will be made only to the company's own employes. The bill contemplates that the payments to unemployed workers after the fund is built up at the end of one year shall be based on their past earnings with a minimum of $5 and a maximum of $10 per week, payments to continue for not to exceed one year. The law is to be administered by the State Industrial Commission and one interesting feature is that where an idle man is employed on state work the money due him under the proposed employment insurance payment goes to the account of the state work. Industries constituting preferred risks only are named in the bill. Arrangement is made that when the reserve created by the individual company amounts to $50 per man employed, the rate of payment shall drop from 2 percent to 1 percent of payroll. Further, that after the reserve reaches the amount of $75 per man employed, the rate of payment shall drop to one-half of one percent.

The entire bill and the conduct of procedure for its enactment are very carefully and cleverly handled. This is an extremely important and pivotal matter for industry, as it is quite probable that what has happened in Wisconsin will spread as have the compensation acts and the income tax to all of our states.

An Interesting Comparison

RECENTLY a large industrial unit took inventory of its 10-year progress. It compared its facilities and earnings today with the then considered normal year of 1922. The result was enlightening. Among other things they discovered that in the eight-year period involved they had increased their productive capacity, through machinery, to the point where they were producing two and a half times as many units in 1931, as in 1923, with nine-tenths as many men—that is, they produced three times as many units per man employed. If their basis of production were the same today as in 1922, they would be in the market for a considerable number of men. This fact, while interesting, does not solve anything. It does show that serious thought is being given to the causes of unemployment, as well as to the very necessary subject of production costs. Industry must reduce its cost of production. It can only do so through the utilization of machinery, which in turn creates its own special problem. It is obvious that we must increase our markets, or find a substitute that will keep our labor fully employed. If this shall be the six-hour day, it would be well to bring the subject out into the realm of frankness. So far, labor has been the advocate, with here and there an industry, such the General Electric Company, agreeing and placing it on trial.

Gold

FOR the first time in history the monetary gold stock in the United States has reached the five-billion mark or approximately one-half of the monetary gold reserves of the world. By the prices which have been in operation during the last few years it might easily be possible for France and the United States to practically absorb the total world reserves.

We might well inquire as to what the value of gold would be under such conditions: two countries of the world with ability to purchase from each other, with all other countries forced to develop a new money medium with which to carry on their business transactions. Gold under those conditions would cease to be a universal medium of exchange and lacking that universality would lose its value. Some other metal or some other means of exchange would of necessity be developed by other nations for the carrying on of their own transactions which medium exchange might have and might not have any value in those countries holding the worlds' gold supply.

Gold has been regarded as a stable money medium accepted throughout the world, theoretically because it had intrinsic value. Would not gold lose all of its value

intrinsic or otherwise if it were so concentrated? The maldistribution of the world's gold supply presents one of the serious problems in the industrial world and it is only because of the fact that the possibility of its further concentration is doubted that bankers and financial leaders do not regard this tendency as one of the greatest dangers to our industrial life.

The Tax Threat To Mining

MINING is engaged in a vital battle for survival. Many mines are closed down—even whole mining districts have been abandoned, and thousands of workers thrown out of employment. With such a situation it is unthinkable to consider any revenue measure that will place any greater burden upon this industry. To date nothing has been done to relieve the tax burdens of mining. This has resulted in the disastrous practice of mining only the most profitably produced ores, which is of course an uneconomic thing, and a policy that will be to the lasting detriment of our mineral assets.

It follows with certainty that the day will come when there will be no revenue producing mineral. The source will be gone, as has in their turn passed the forests, which once made Michigan rich. The position of the United States in the production of mineral is jeopardized. Other lands with rich mineral resources are taking our place in the markets of the world and their workmen are being trained and employed by our own technicians who have gone from our shrinking industry.

Rather than to bear additional tax burdens we may well see the day when American mining enterprise will be bonused to save the Nation.

Determination—Plus

MARTIN L. DAVEY, of the famous tree firm, has a simple solution for the depression. It is action, plus determination. Mr. Davey says:

"In my judgment no greater patriotic service could be rendered right now than by a united and determined drive on the part of the army of salesmen to pry the business loose, anywhere and everywhere. It is money in circulation that makes prosperity. Every order that is secured by an aggressive and patriotic salesman puts that much money into circulation, gives that much more employment and creates that much more buying power. You owe it to your country to get as many orders as you can possibly tear loose in this period. Right now it is practical patriotism of the highest order. Every time you make a man buy what he really wants or what he ought to have in a period like this, you are doing a distinct service for your country * * *"

All of which may be, and probably is, true. The salesman can help. He may persuade, coax, threaten or beleagure his market, but it seems to us that he is only creating a job for the collection department of his company. Industry must have something more substantial than faith, more real than optimism. The problem is much deeper than salesmanship, no matter how important that factor is. It involves the purchasing power of the world—its money mediums, its credit structure, its industrial leadership. Determination is fine but it needs a plus sign to make it effective—determination *plus* may start the wheels revolving.

Mining As An Investment

SO EMINENT an authority as the *Atlantic Monthly* has the following to say on the subject of mining as an investment:

"If, in comparing the losses of mining with those in manufacturing due regard is given in each of these branches of industry, the comparison will be immensely in favor of mining. It will be found that where mining investments have been made with ordinary business intelligence and the affairs of the company are economically looked after, losses are far less from mining than from any other business known to modern civilization. Governmental reports and other authorities that cannot be doubted show that losses in mining are 40 percent less than in any one of the four other leading industries of the world, commercial, manufacturing, trading and banking.

"Even agriculture is dependent upon the climatic conditions, and is probably much more speculative in most instances than a thoroughly prospected mining property, properly managed. Mining was once a hazardous speculation, but it has now been reduced to a conservative, systematic business, conducted on modern business principles."

Credit

WHAT is credit? Primarily the word involves indebtedness. When I obtain credit I become indebted to someone. It is frequently said that the world's business is done on credit. The greater the volume of credit the greater the indebtedness. When my debts become too great, my ability to pay become lessened; confidence in me is destroyed and my assets must be immediately turned into cash to meet current obligations, thus breaking the market price of my product. Others in my line of production must cut prices to meet the sacrifice price at which I must part with my property in order to meet my obligations. The toboggan of prices begins. Everybody suffers. Even the speculator is made to lose. Prices start downward; sales are made at lower prices to avoid still lower prices. No one dares to buy and the panic is on. What started the break? A too great use, or a misuse, of credit. Those who keep out of debt can survive. Those who keep out of debt do not do the business of the world. They keep safe and they remain worthless to the business of the world.

The above picture illustrates the process; it does not picture the actual cause; namely, that public conditions which allowed excessive borrowing, thus destroying the foundation which would not have been possible had there been the proper relation between money and credit and a proper limitation of bankers credit to real money. A stabilized money medium should be established, as nearly as possible, uniform throughout the world and in proportion to the business requirements of each of the several countries. These currencies should, in certain fluctuating limits, bear a fixed ratio to their metallic reserves at market value. If the world's gold is not sufficient to support this then silver should be used on the same basis, i. e., its actual market value on a gold basis in order to support sufficient money with which to transact the business of the world.

Accident Prevention Work at the Coal and Iron Ore Mines of the Woodward Iron Company

By L. M. Northcutt*

THIS ARTICLE is submitted in the hope that it may bring a message for the present and future betterment of accident prevention work, and not as a record of accomplishment of which to be proud.

The operations covered in this article consist of two coal mines producing annually approximately 1,000,000 tons bituminous coal, and two iron ore mines producing approximately 1,000,000 tons iron ore annually. The coal mines, Mulga a shaft and Dolomite a slope, are located approximately 12 miles northwest of Birmingham, Ala. The ore mines, No. 1 and No. 3, are located on Red Mountain, approximately 10 miles south of Birmingham. Both ore mines are slope openings.

Dolomite coal mine has been operated continuously for upwards of 50 years; Mulga has operated continuously for upwards of 25 years. Both ore mines have been operated continuously for upwards of 50 and 30 years, respectively.

Organized safety and accident prevention work has been carried on since 1919, however in this article the writer does not feel justified in delving back into old records and will try to present the more recent history of our accident prevention work.

Our safety organization also includes the by-product works, blast furnaces, railroad and shops department. It is headed by the Administrative Safety Council which is composed of all works or departmental superintendents, chief engineer of mines, general superintendent of mines, assistant general manager, chief engineer, general manager, chief surgeon, and the director of safety. At the present time this committee has no regularly appointed meeting date but is assembled in cases of serious or fatal accidents for the purpose of determining the cause, placing the responsibility and recommending policies for the elimination of similar accidents.

Practically the entire personnel of the Administrative Safety Council attend a weekly operating meeting in the office of the general manager. As a part of this meeting the director of safety reads before the meeting a report which is compiled by him covering all lost time accidents which have occurred during the preceding week, going into detail as to cause and nature of injury, probable duration of injury, and in so far as possible places the responsibility for the failure. This report also carries the recommendation of the director of safety to prevent a recurrence of a similar accident as well as his recommendation as to discipline to be meted out to the person or persons responsible for the accident.

In addition to the details of current accidents, this report carries a recapitulation of all works and divisions showing the total number of accidents which have occurred during the current week, the preceding week, current month to date, preceding month, this year to date, same period last year, and the total number of accidents in the preceding year. This report is mimeographed and everyone at the meeting is given a copy to read while the director of safety is rendering his report. Open discussion follows the reading of each accident. Copies of this entire report are sent to departmental heads and all foremen, and copies are posted on the bulletin boards both underground and on the surface where they are read by the workmen.

We have one safety inspector and an assistant for the coal mines and one safety inspector for the ore mines. Their sole duties are accident prevention work. There are no standing committees, but whenever an accident of a serious nature occurs, or any accident which causes loss of time, in addition to the regular investigating procedure, the superintendent appoints a committee consisting of three fellow-workmen of the injured man to make a separate investigation and report.

Our coal mines are gassy. Dolomite liberates approximately 334,000 cu. ft. of Methane per 24 hours; Mulga liberates approximately 920,000 cu. ft. of Methane per 24 hours. Each mine is ventilated by two exhaust fans at different locations, on the split system. The mine air is regularly sampled and analyzed, at least once each week, and should it be found that any individual split exceeded

* Safety Director, Woodward Iron Company.

.50 percent Methane immediate steps are taken to increase the volume of air or separate splits are established. Air readings are taken by the safety inspector and his reports are forwarded to the general superintendent of mines, general manager, president, and director of safety. This report shows weather condition—whether fair, cloudy or raining; barometer reading; water gauge at fan; speed of fan and cubic feet of air per minute at return, and in the body of the report is shown the various splits, the volume of air per minute on the return and its Methane content. Each fan has an auxiliary drive unit. The auxiliary drives (three of which are gas engines) are tested each week and are required to operate the fans a sufficient length of time to discern any defects that might occur. The change from one drive to another is done in approximately three minutes. There is also one standby fan at each mine.

Electric cap lamps are used in the coal mines.

In order to reduce the dust made in operating the cutting machines, all machines have been equipped with water on the cutter bar and it is a dischargeable offense to operate a cutting machine without sufficient water on the cutter bar.

Our major rock dusting program was begun at Mulga mine in September, 1927. At that time we installed a Mine Safety Appliances Company low pressure rock dust distributor and started out with the intention of rock dusting our main lines and cross entries only. With a crew of four men consisting of one motorman, one man to handle the nozzle and two men to feed the rock dust from the mine car to the hopper of the distributor, we were able to rock dust a maximum of 6,600 ft. per nine-hour day, applying from four to four and one-half pounds per linear foot; however, our average per day over a given period has been approximately 4,000 linear feet per day—the distance dusted in any one shift depending on the location in the mine and whether or not it was the initial application.

After dusting the main lines and cross entries in Mulga the machine was moved to Dolomite mine on October 5, 1927, and the same schedule as above described was carried out there. Very soon after this it was decided to rock dust more extensively and it was found that one machine would not answer for the two mines and an additional machine was purchased, the machine being a Mine Safety Appliances Company high pressure rock dust distributor, capable of dusting through 500 ft. of 3-in. hose—the idea in this being that we could dust old airways and worked out territory at least 500 ft. from the source of power and tracks. This program was rushed to completion until we had dusted every accessible place, giving the air courses and any places where there was a chance for propagation from one panel to another a coating of rock dust running about 6 pounds per linear foot for a distance of 500 ft.

Our rock dusting has been maintained to a standard of not less than 70 percent inert until at the present time we have dusted approximately 60 miles of main haulage and entries in our Dolomite mine of which approximately 28 miles is active, and 49 miles in our Mulga mine of which approximately 8 miles is active.

In addition to the machine dusting, in August, 1928, we began to rock dust all rooms up to a distance of 7½ ft. of the working face (this work is done by the miner as the face advances) an application of rock dust being put on after each cut.

The major portion of the rock dust used is purchased locally and contains about 95 percent combined carbonates; 3 percent silica; the screen test running around 65 percent through 200 mesh with a very small percentage as low as 50 mesh.

For maintaining our standard of not less than 70 percent inert matter in our mine dust one man is employed for sampling rock dust for the two mines, who works four days each week collecting and analyzing the dust. The roof and rib samples are kept separate and are analyzed first separately and then thrown together and analyzed to determine the composite, the incombustibles being determined by the Volumeter method. The results are tabulated and are kept as a permanent record.

Portion of By-Product Plant of the Woodward Iron Works

From these tests any composite sample running less than 70 percent inert must be re-dusted immediately, another sample taken and the results reported for that particular section of the mine. To give an idea of the sampling, using a typical month's report, in the Dolomite mine 240 samples were collected from 120 places; in Mulga mine 96 samples were taken from 48 places—a total of 336 samples from 168 different places in the two mines. The samples are taken about 1,000 feet apart on main haulageways and cross entries, no samples being taken from the same place where samples were previously collected. Samples are taken in various rooms in each section of the mine. Roof and rib samples rarely ever run under 95 percent incombustibles and the floor samples will run an average of better than 60 percent incombustibles. Following is the average of all mine dust samples taken during the calendar year 1931:

	Percent incombustibles		
	Roof and ribs	Floor	Composite
Dolomite mine	96.0	66.3	80.0
Mulga mine	95.0	65.0	81.0
Average (com.)	95.5	65.5	80.5

After each day's samples have been collected and analyzed a written report is made showing the location samples were collected, the percentage of incombustibles on the roof and ribs, floor, and the composite; also whether the place was dry or damp where sample was collected. A copy of this report is sent to the officials of the company, including the president. In addition to this report on rock dusting each mine is required to make a weekly report of rock dusting progress — that is, the number of feet of haulageways or cross entries dusted by machine and hand, giving the location and distance. This report is forwarded to the general superintendent of mines and is required to be in his office on Tuesday of each week. After this report reaches the general superintendent it is turned over to the mining engineering department who

Portion of surface plants, Mulga Shaft, Coal Division, Woodward Iron Co.

Modern steel tipple and compressor building, No. 3 Red Ore Mine

in turn post the progress on maps of both mines (which are cut up into various sections of the mines and bound in folio for ease of handling) showing the portions dusted during the previous week by red lines, removing the preceding week's progress and substituting black lines therefor. A tabulation on the first sheet of the folio shows the main haulage and entry feet dusted, room feet dusted, and divides this tabulation into hand and machine dusting. After the map has been posted it is sent through the official channels to the assistant general manager, general manager and president.

No definite time limit is set on redusting haulageways and cross entries, this being determined by the sampling, and sampling is arranged so that a representative sample of the entire mine is taken at least once each month.

In further abatement of coal dust hazard, tops of all loaded cars are sprinkled at the first collective parting, and in some cases the trips are sprinkled the second and third time before arriving at the tipple.

It may be of interest to know that the total cost, including distributing equipment and its depreciation, from the beginning of our rock dusting program to date has been a fraction under 2 cents per ton of coal produced during that period, and that the current cost of maintaining our rock dusting to the standard of better than 70 percent incombustibles averages 1¼ cents per ton —and that one mill per ton of coal produced covers the cost of sampling and analyzing the dust.

Each employe is given a rule book at the time of employment and is required to sign a receipt showing that he has received the same. He is encouraged to study these rules and at any time he may stand an examination of the rules (this examination is conducted by the superintendent) and if in the superintendent's opinion he knows the rules well enough, he is presented with a gold plated safety emblem pin.

All employes are checked into and out of the mines. They are given a brass check bearing their pay roll badge number before entering the mine and upon leaving the mine this brass check number is deposited in a box at the gate-house. It will be noted that the workman keeps his check number on his person during the time he is underground for purposes of identification in case of accident.

At the close of each shift the check-board in the gate-house is checked against the gate-house record and in case any workman is unaccounted for, investigation is made and if his foreman does not have satisfactory explanation as to why he has not checked out at the regular quitting time, a searching party is sent back into the workings to locate him. Unless the workman was detained by something beyond his control, he is required to pay the time of the searching party. The latter prevents laxness or tardiness in checking out of the mine.

Special man-trip cars are used in lowering and raising men into and from the mine. They are equipped with safety ropes and a second engineer is required on the hoist while handling men (this in case something happening to the regular engineer). In addition to the latter precaution all hoists are equipped with Lilly hoist controllers. Both loading onto and from these man-trips is supervised by a foreman. On the bottom yard and at all places in the active workings sections where man-trips are run special safety waiting rooms and loading stations are maintained. The motor pulled man-trips are each under the supervision of a designated foreman who supervises the orderly entraining and detraining of the men and maintains order en route. All man-trips are handled with two locomotives, one on each end of the trip, for smoother operation of the trip and as a precaution in case any part of the trip became uncoupled on a grade.

The mines are divided into sections and a section foreman placed in charge of each particular section. These men work under the supervision of the superintendent or general mine foreman. Each section foreman is given territory which he will be able to cover at least twice each day, and his duties are chiefly to see that the work is carried on in a safe and efficient manner.

Shot-firers are employed and work directly under the section foreman and mine foreman. Permissible explosives are used and the powder is handled into the mine in specially built powder cars that are thoroughly insulated. The powder is distributed from this car between the operating shifts to powder boxes that are located so as to be accessible to the shot-firers. Blasting caps are handled from the surface by the shot-firers and are kept in insulated cap containers. All shots are prepared and the shooting done by the shot-firer. The shot-firer is also required to make an examination for gas and unsafe conditions before and after shooting. If he finds the place improperly timbered or any other unsafe condition existing he refuses to shoot the place and if on his examination after shooting he finds any unsafe conditions he boards the place off and a competent man puts the place in a safe working condition before the workmen are allowed to enter.

All cutting machines, pumps, loaders, etc., are equipped with extra ground wires to prevent shock in cases where equipment becomes grounded while in operation.

Block signals are used on all haulages, and trip riders ride the rear end of all trips where trips are pulled and the second car from the front end of all pushed

trips, however trips are not pushed except in certain cases. The mines are also equipped with telephones throughout which are so arranged that connections can be made from the underground to the general office, which is located at Woodward, Ala.

Our accident prevention program has also included the safeguarding of all equipment and machinery whenever possible or practical; the adoption of screen goggle equipped caps; the encouragement of workmen wearing hard toe safety shoes by selling them through our stores at a very reasonable price; the awarding of prizes through the suggestion committee for safety promotion and accident prevention ideas, etc.

Practically all the foregoing has been written with the coal mines in mind, however, with the exception of dust prevention and ventilation it also applies to

Loading coal cars from a conveyor

the ore mines. The ore mines have natural ventilation, and open carbide lamps are used. However, about a year ago while sinking one of the slopes to the property line we encountered a small quantity of Methane gas. Since that time we have taken the precaution to have all advancing development places run for gas with a safety lamp just as we do in our gassy coal mines, both at the beginning of each shift and occasionally throughout the shift.

In connection with the statistics of our accident record to follow, it will probably not be amiss to state that approximately 75 percent of the entire output of the ore mines is loaded mechanically, and that about 55 percent of the total output of the coal mines is loaded mechanically. About 40 percent of the coal output comes from the extraction of pillars, leaving 5 percent for hand loaded machine cut coal.

In conclusion the writer wishes to state that it is his personal opinion that the essential element in accident prevention is the will to eliminate accidents. In his several years connection with the Woodward Iron Company he has never heard the management admit that an accident was unpreventable—that it was the result of a failure somewhere. Of course, this idea had to be sold, not only to the workmen, but in a large measure to the foremen and superintendents. It was gradually sold to the superintendents and departmental heads through the eternal teaching of the management that accident prevention work was not a side issue to operating but one of the most essential elements of efficient operation. In other words, an organization which did not prevent injury to its workmen was not an efficient organization. This very important idea was instilled into the foremen and supervisors by their respective superintendents. Every foreman is held strictly responsible for the safeguarding of his workmen from personal injury. Of course, accidents have occurred since the time this very forceful campaign was inaugurated, but there has been a constant betterment in our accident prevention record. Each foreman, knowing that he is held strictly accountable for the safety of his workmen will more quickly recognize potential danger to his men and correct the condition.

Education of the workmen through first aid training courses has assisted in our accident prevention work. While this has not been carried out 100 percent, a large majority of our workmen at both coal and ore mines have received this training. This work was done under the direction of the U. S. Bureau of Mines, assisted by trainers from our own organization and our resident physicians. First aid stations are maintained at central locations in the mine, also on the surface at each mine. These stations have proven very beneficial in making an injured person comfortable.

Additional and very forceful educational work is done among the workmen through just discipline. This discipline is brought about in part through a system we have inaugurated whereby any foreman or other official at the mine upon seeing any infraction of a safety rule or any other unsafe or potential injury cause, issues to the man what is known as a "Violation of Rule or Unsafe Practice" slip, whereon is shown the infraction together with the offender's name and badge number. The foreman can recommend whatever discipline he deems the act justifies. This slip is given to the offender who is required to take it in person to the superintendent who passes on the discipline to be meted out, which can consist of a reprimand by foreman, reprimand by superintendent, suspension for a given number of days, or, if the superintendent thinks the act justifies or warrants it, discharge from the services of the company. In order to make sure that the offending workman goes by the superintendent with his slip, the foreman blocks his number at the gate-house.

A file of violation of rules slips is maintained in the office of the superintendent where it will be quickly noted by the superintendent if a man receives more than one slip, when proper corrective measures are taken. This file becomes a permanent record and workmen learn that their rating is based to a large extent on keeping this record clear.

Finally, but having considerable good effect along educational lines, a monthly safety meeting is held in each division at which all workmen and foremen are urged to attend. At this meeting, the superintendent acting as chairman, all accidents which have occurred since the last meeting are discussed and an effort made to determine what can be done to prevent similar accidents. When it is possible, the injured person is required to be at this meeting and he is called upon to give his version of how it occurred and how it might have been avoided. At this meeting the director of safety usually makes an informal talk, and the foremen and men are invited to do likewise. Attendance at these meetings is helped by having some kind of short musical program by employes in the community and through drawing of tickets good in trade at the company store, each man being given a numbered ticket (numbered on both ends) as he enters the auditorium, half of which is dropped into a box for the drawing, the other half held by the workmen. The drawing is made so that approximately one out of every 20 persons present (excepting foremen) will draw a prize, usually of $1 value.

Safety man-loading station, Mulga Mine

It goes without saying, of course, that plant cleanliness and orderliness, sometimes termed "Good Housekeeping," is an essential part of accident prevention work.

Following is the percentage decrease, per 1,000 man days, in accident rate under five-year period prior to year 1930:

	Coal mines	Ore mines
1930.....	20.0%	66.2%
1931.....	42.1%	68.4%

MARKET TRENDS

Tin

THE FIRST of the month found tin very dull and inactive. As a result of the international quota plan, last year's world deliveries decreased 8,878 tons, and world supplies 13,380 tons. The second week in February, tin declined 1/8 cent and the General Council of the International Tin Research Commission met in London to discuss expansion of uses for tin, and the preservation and strengthening of existing markets.

A week later, tin advanced ½ cent a pound as the result of many new inquiries, but immediately declined in New York, 10 cents per 100 pounds due to the decline in Sterling. On February 23 tin spurted 245 points above the year's previous high.

The month closed, however, with practically no movement. February arrivals amounted to 1,751 tons with 265 tons afloat to arrive before March 1, and 1,800 tons scheduled for March delivery.

J. H. Van Ketwich, commercial adviser to the Dutch East Indies Government, said: "As a result of the splendid cooperation of the principal tin producing countries of the world, the movement to nationalize the tin industry is proving successful." He referred to the International Tin Commission, formed in 1931 to regulate the world's tin production under a quota agreement of producers, in the Dutch East Indies, Nigeria, Bolivia, Malaya, and Siam. Effective January 1, 1931, production is rated to be 110,000 tons per annum. Annual consumption is 120,000 tons. Twenty-one thousand tons accumulated in the pool will be held off the market until spot price in London averages £165 per ton for one month. The pool will then release 5 percent of its reserves.

Lead-Zinc

THE ENTIRE MONTH has been featureless in these metals. World zinc production in 1931 was 1,130,203 tons, and for the United States 301,073 tons. Zinc was quoted at 3 cents, the lowest since 1895, and broke 2.95 cents—2.90 cents and finally a record low of 2.80 cents per pound. January figures showed zinc shipments just balancing production. The middle of the month, lead was active in St. Louis, in carloads at 3.55 cents per pound. Smelter stocks of refined lead in the United States showed over 160,000 tons, the largest surplus ever recorded.

Silver

PLANS FOR SILVER stabilization and additional bills before Congress marked the month. The market was quiet at 29½ until the middle of February, when due to the active discussions and plans proposed, trading in silver futures became heavy.

On February 16 the House appropriated $5,000 for further investigation of the silver problem by the Committee on Coinage, Weights and Measures. Southern and Western Senators accepted the invitation of the French Parliament through M. Pierre du Pacquier, for an informal international conference to study the restoration of silver. Senator Borah, of Idaho, was requested to head the American group, and Senator Pittman announced that representatives of Great Britain, Canada, Belgium, and Italy would be invited to join the conference. Senator Pittman also introduced a bill providing for the purchase and coinage of American-produced silver, and the issuance of silver certificates in payment therefor.

Late in the month silver futures again advanced sharply and over one-quarter million ounces sold in the outside market at 31½ cents. Three million ounces were traded on the National Metal Exchange at 31 cents. This was the largest silver movement so far this year. The decrease in production and the crisis in the Far East, are causing withdrawals for military operations.

Aluminum

CONSUMPTION OF ALUMINUM is gradually increasing; world production has gained 40 percent in five years; domestic production has increased 58 percent in that time. Production is regulated to demand. The United States leads in output of this material; six countries supply 88 percent of the world's production, the United States, Canada, France, Germany, Switzerland, and Norway. Three countries, France, Hungary, and the United States supply 66 percent of the total bauxite ore produced. Three-quarters of the entire bauxite output goes into the manufacture of aluminum, the balance being used in cement, refractories, abrasives, and filtering mediums.

New uses are continually being announced. Among them are truck and bus bodies, piston alloys, window screens, structural shapes up to 85 ft. by 14 in., strong aluminum alloy wire for fences, roofing, paint, wood filler, interior trim, as a base for chromium plate, and as foil.

The Cleveland, Ohio, region shows active demand for re-melt aluminum, which is extensively used in household appliances such as vacuum sweepers, washing machines and ornamental plates.

Copper

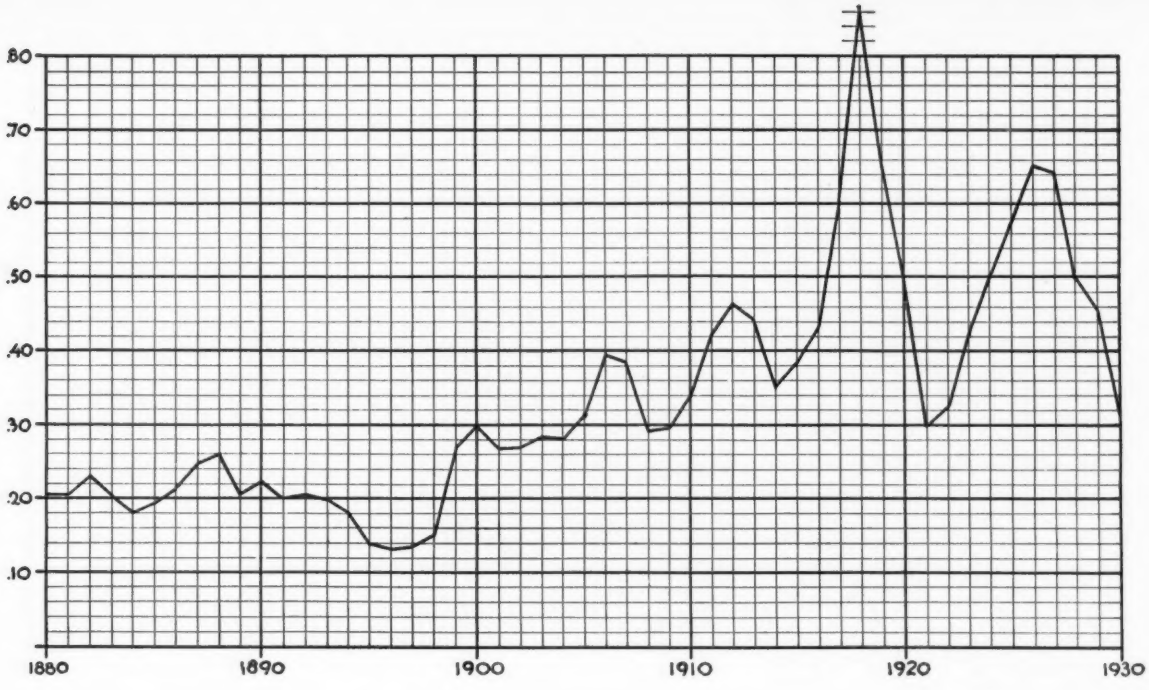
THE MONTH OPENED with copper unchanged, and dealers unable to dispose of second hand copper at any price. Electrolytic copper was quoted at 7¼ to 7½ cents for June delivery with spot delivery abroad at 6¼ cents per pound.

Roan Antelope mill treatment of ore amounted to 159,900 tons in December, and 90,700 tons in January. Their costs, quoted in this department in February, were given as 7.17 cents per pound f. o. b. United States, for electrolytic copper. This figure has been further amplified by the quotation of 4¾ cents per pound cost f. o. b. refinery, on a 65 to 70 percent capacity. The middle of the month copper dropped to 6 cents, and re-sale copper to 5⅞ cents per pound. In order to continue operation the industry is depleting its ore reserves and selling below the cost of production. It has been estimated that it would cost at the least two million dollars to re-open the copper mines of the United States, were a shutdown made. Caving systems would become compacted, and many large ore bodies would be lost, or recovered only at increased cost.

Improved credit sentiment in Washington brought immediate reaction in the industry, and in the middle of the month, 3,500,000 pounds were sold abroad, and the price advanced ¼ cent per pound. Smelters were not anxious to sell at 6¼ cents. Refineries at the end of 1931 reported 905,000,000 pounds of refined copper in stock or 47 percent increase over 1930.

Utah Copper, Nevada, Kennecott, and International Nickel Companies all omitted their quarterly dividends, and discussion of the British tariff free list was active. This list as promulgated included gold, silver, iron ore (including manganiferous, but not chrome), scrap iron and steel, iron and cuprous pyrites, sulphur, tin ores and concentrates, mineral phosphates of lime, and radium compounds and ores.

After three active days of foreign buy-



Average price of Straits Tin, prompt delivery, New York

ing, Copper Exporters, Inc., quoted 6½ cents per pound, and on February 25 the British Government announced that unwrought copper would be exempted from the Tariff Act taking effect March 15. This removes many complications, for had the Rhodesian, Canadian and Australian producers retained the preferential basis established by the act, they would undoubtedly have withdrawn from Copper Exporters, Inc.

Bids on domestic copper ranged from 6 cents to 6.375 cents per pound.

Representatives of Katanga officials arrived in this country to discuss copper. Stocks above ground continue to increase and the industry is divided between complete shut-down and allowing the situation to run its course with further decline in price and ultimate elimination of high cost operations.

News items from Belgium say that the Belgian Government would not agree to a complete shut-down of Katanga, since the welfare of the entire province depends upon continued operation of the properties. They also claim that regardless of the low price of copper, Katanga costs are so low, they can continue to operate at a slight profit.

The *Metal Bulletin* of London says the withholding of American copper statistics is a sore point in Europe as well as in the United States, and much speculation is had why stress is given to new export rules in copper while further curtailment is clearly indicated.

The Mohawk Mining Company announced that their 1931 costs were the lowest in the company's history; and that they are storing their product awaiting better prices, while operating 6 days per week to minimize mining costs. The company's ore reserves are estimated at two years of maximum production and two years of final depletion. Their 1931 yield was 29½ pounds of copper per ton of ore.

Antimony

BEGAN THE MONTH at 5.85 cents per pound with dealers holding for 6 cents. Chinese affairs apparently had little effect on available supplies. Bonded stocks in New York were estimated at 597 tons. Toward the end of the month prices rose ⅛ to ¼ cent.

Manganese

A CARGO OF RUSSIAN ore reached the Ensley-Fairfield furnaces at Birmingham, via Mobile and the Warrior River barge line of the T. C. I. & R. R.

Mineral Stabilization

A BILL introduced by Senator Walsh, of Massachusetts, would permit curtailment of production as a means of stabilizing industry. The Federal Trade Commission would be empowered to give advance approval of any proposals for this purpose.

Anthracite Coal

THE LAST WEEK in January, a 4,000-ton cargo of Chinese anthracite was unloaded at Boston. It was said to be of low ash content and sold for $9 to $10 per ton.

Bituminous Coal

THE COAL MARKET stiffened in the West, due to zero weather. Output was steady, and no bill coal found an active market.

Nut and slack coals in New England were in demand which was met entirely from stocks. Colder weather called for more r. o. m. Railroad rate reduction more than offset any savings by truck, and competition created a differential of 25 cents per ton in favor of Providence.

On account of the easy winter, Chicago dealers have not carried their usual stocks. The yards at the head of the Lakes are heavily overstocked and next summer's Lake movement is expected therefore to be light.

The second week in February a cargo of foreign bituminous coal consigned to the Canadian National Railways was unloaded at Boston. Rates on foreign exchange with depressed Sterling, made this possible.

Domestic buying in Ohio continues from day to day with relatively warm weather. Railroad fuel is purchased on a weekly basis and few if any railroads are asking for annual contracts, which were formerly executed as of April 1, each year.

ECONOMY and ECONOMICS *in* Coal Mining

By G. B. Southward

THE DICTIONARY defines economy as "the practice of thrift and the saving of expenditure." It defines economics as "the science that treats of the production of wealth." In coal mining, the practice of economy has been carried to a point where there is nothing more to be said on the subject and there is little, if anything, more that can be learned. Unfortunately, economy has not brought profits. The application of economics may prove more helpful; at least, the definition seems to hold out some promise when it states that its aim is the "production of wealth," and any science which offers a chance of producing even a small degree of wealth or profits in coal mining is well worth looking into.

There are only two ways to bring profits to coal mining—by raising the selling price or lowering the production cost. The first method is certainly very attractive and we can always hope for something to happen to raise the price of coal. There is no law against hoping but at present there does seem to be a law against doing anything more than that. So unless we are willing to wait until that situation changes and the price of coal can be increased, the only alternative left is to decrease the production cost. Something can be done about that and we don't have to wait to do it.

MINING COAL is "producing tonnage"—by cutting, drilling, hauling, loading, cleaning and all the other various underground and surface operations. These operations require the work of men, or men and machines. In order to lower the cost of mining coal, the amount of money spent for this work must be reduced—either by maintaining the average production and decreasing the wage rate paid or by maintaining the wage rate and increasing the production of tonnage for the men and equipment used. The first method can be classed as economy or "saving expenditures," and the second as economic or "production of wealth."

In order to see how the tonnage per man affects coal mining costs, the figures in Table I are submitted as a basis for discussion. These figures are purely arbitrary and are not taken from a typical cost of any particular mine or of any particular district. Neither are they intended to represent any actual proportions between the various cost items and different cost groups.

TABLE I

Division of Mining Cost Items

Group A—Fixed costs per ton.		
Power and supplies	$.22	
Supervision	.05	
Compensation	.03	
Royalty	.10	
Total fixed cost	$.40	per ton
Group B—Fixed expenditures— (Reduced to cost per ton)		
Administration	$.10	
Taxes—Insurance	.05	
Depreciation	.05	
Total variable cost	$.20	per ton
Group C—		
Labor cost	$.90	per ton
Total operating cost	$1.50	per ton

In Table I the total costs are divided into three groups. Group A includes the fixed costs per ton which remain constant irrespective of the total tonnage mined. Group B includes fixed expenditures—reduced to a cost per ton basis—whose total amount is constant each month irrespective of the tonnage produced. This cost per ton varies inversely with the number of tons mined. Group C includes all day and contract labor used underground and on the surface. This cost per ton varies directly with the wage rate paid or inversely with the tonnage produced per man employed.

FOR THE PURPOSE of discussion it is assumed that these figures are for a mine worked entirely with hand loading and that no further reductions or savings in the use of labor and material can be put into effect. It is assumed further that this mine is producing 1,500 tons per day and that the average production for all men employed underground and on the surface is 6 tons per man day. The labor cost of $0.90 per ton makes an average day wage of $5.40.

To show the effect of a decreased selling price, suppose we consider that it is necessary to reduce the operating cost of this mine to $1.25 per ton in order to meet the market and continue mining. If the production of 1,500 tons per day is to be maintained, the costs in Groups A and B would be unchanged at a total of $.60 per ton. Therefore, the labor cost would have to be reduced to $.65 per ton. With an average production rate of 6 tons per man day, the average day wage paid would have to be lowered from $5.40 to $3.90. To maintain the wage of $5.40 per day, the production per man would have to be increased to 9 tons per shift for all men employed.

In order to illustrate more nearly what has been happening during the past two years in coal mining, suppose we consider that, in addition to the necessity of lowering the operating cost to $1.25 per ton, the mine production must be decreased from 1,500 to 1,000 tons per day. The cost items in Group A would remain unchanged at $.40 per ton. The items in Group B, which vary inversely to the tonnage, would increase from $.20 to $.30 per ton. This makes a total of $.70 for Groups A and B and the labor cost therefore would have to be reduced to $.55 per ton. If the production per man is not increased above 6 tons per shift, the average pay rate for all men employed would be lowered to $3.30 per day. If the average wage is to be maintained at $5.40, the production per man employed would have to be increased to 10 tons per man shift.

THE FIGURES used in the foregoing examples may not apply to any mine in the United States. But the principles which they illustrate apply to every mine. In either of the two conditions cited, there would be only one way to increase the production rate to 9 or 10 tons per man shift. By mechanized mining. Hand mining could not produce so high a tonnage rate per man employed and with hand mining the only alternative would be to reduce wages. Reducing wages may be good economy—although that is debatable—and in some cases it may be advisable in order to keep a greater number of men employed, but in general it is certainly bad economics. It does not "produce wealth."

Improving Washing and Preparation

at Empire Mine, DeBardeleben Coal Corp.

By C. V. Barrow*

How the use of Deister Overstrom Diagonal Deck Tables and Leahy Screens benefited coal washing and preparation at this mine

THE EFFICIENCY of any coal washing operation depends largely on the correctness of installation and the skill of operation. Accurate operation is of first importance; without it even a well designed plant lacks control and becomes of little value.

An operator in selecting new equipment, after comparing results obtained by some manufacturing concern with present units in operation, faces a difficult decision, but none the less valuable. Difficulties experienced with former equipment should be overcome as far as possible. Every old plant has some outstanding difficulty requiring correction sooner or later.

The primary advantage for consideration is the improvement in quality of market coal accompanied by a corresponding reduction in coal content of the refuse. Other advantages for good plant construction are also considered, and are as follows: First cost of plant, low maintenance cost, labor costs, low power costs, simplicity of control of operation, small amount of make-up water required, elimination of excessive handling thereby reducing breakage, etc.

A study of the raw product and the nature of the coal seam is very essential. The character and an estimate of the impurities between 1.40 and 1.70 specific gravities that might require special treatment, should have careful consideration. Float and sink data of both the raw and finished products should be made and compared with results obtained by washing different coals by different processes.

Difficulty of washing the smaller sizes of coal with the jigs then in use, high ash content of the pea and slack sizes, high coal content of the refuse, lack of uniformity of the product from day to day—these were some of the objections that the company hoped to remedy in turning to this more modern equipment.

One of the first decisions was to submit a railroad car of screenings (⅜" x 0) to the factory for factory tests. Officials of the company, together with two technical engineers, visited the factory to assist in making the tests and compile the data, in order to determine whether or not this coal, in the sizes indicated, could be effectively and efficiently handled on this type equipment. They also made a study of the construction and operation of this type of table.

OPERATION:

Raw coal ½" x 0, or ⅜" x 0, with twice its weight in water, is fed to the deck of the table through a feed box. Distribution boards are provided adjacent to the feed box so that an even distribution of water over the rest of the table may be effected. An inclination of the table which is adjustable permits the clean coal to be washed down the long edge of the table into the washed coal launder.

As soon as the raw coal with its contained impurities reaches the deck it stratifies, heavy material or refuse on the bottom and the lighter coal on the top. The action of the table together with the cross flow of the water separate the shale, slate, sulphur-bearing coal, bone and other impurities in the refuse according to the respective specific gravities of each impurity.

Deister-Overstrom Diagonal-Deck Coal Tables

THE SEPARATION is assisted by the reciprocating action of the head drive, with a corresponding motion of the deck at the rate of approximately 275 times per minute, with a stroke length of ¾ inch. The refuse is driven out from under the clean coal through wood, or rubber, riffles to the refuse edge of the table. The riffles aid in collecting and guiding the refuse to the discharge point, and the motion of the table finally projects it into the refuse launder.

When first adjusting tables, some difficulties were quickly overcome by the use of float and sink data on the raw and finished products. Such changes as degree of pitch, or angle of the deck, correct feed, and the amount of water feed, were all governed to a great extent by laboratory results. One outstanding difficulty occurred in the irregular feeding of the raw coal, the angle of the chutes to the tables being changed many times before satisfactory results were obtained.

Because of the fact that some companies have had more or less trouble in adjusting this equipment, the following information from the Bureau of Mines—Serial 2950 by B. M. Bird & H. C. Davis—is appropriate:

* Chief Chemist, DeBardeleben Coal Corporation, Sipsey, Ala.

"Stratification contrary to common belief will not account for the separation effected by the table. Cross flowing water, in addition to removing the top strata, must also have an important selective action in completing the separation according to specific gravity, both in the upper, and the lower strata found between the riffles.

"As little water as will maintain mobility should be used on the coal-washing table. As the quantity of water is reduced, a larger proportion of the moving water will inevitably find its way toward the bottom strata. This will result in slowing up the travel of the coarser sizes without correspondingly slowing up that of the fine sizes."

"The table under these conditions will discharge the fine sizes of any specific gravity close to that of the coarse sizes. The more nearly the condition obtains, the better the table can wash unsized fines."

The coal which is being washed in the jigs is 3" x ½" in size. In passage of this size coal from the dry screens, through the dry bins to the jigs, there is some breakage and the jigs, to a limited extent, are again confronted with the problem of cleaning this smaller coal—the very thing which the tables were intended to obviate. After this 3" x ½" coal passes through the jigs, it goes by elevator to a revolving screen which screens out the ½" x 0" coal. This coal is laundered to one of the tables, where it is mixed with a quantity of dry coal (½" x 0"), and thus re-washed. One of the four tables in this plant handles exclusively this coal as described.

CAPACITY:

EACH TABLE is capable of handling about six tons per hour, the four tables handling around 240 tons per day.

USES:

The coal from these tables is an excellent product for by-product coke ovens, pulverized (when dried) and blacksmithing.

The following are the advantages derived from the use of tables, over jigs, for washing these particular sizes:

(1) Quality of coal and refuse produced greatly improved.
(2) Washed coal containing a minimum amount of ash and sulphur bearing refuse.
(3) Pronounced saving in fines ¼" and down.
(4) Although employing wet gravity principles full visibility of separation is afforded.
(5) Simplicity of control of operation.
(6) Low labor operative cost, one man easily handling four tables.
(7) Results accurately controlled by having small amounts of coal on each table, as compared to having a large amount, say 200 tons, on one jig.

EFFICIENCY:

THE ACCOMPANYING analytical data should help to show degrees of efficiency obtained at this plant.

(2) The free swinging screen jacket design eliminates breakage of the screen and allows a complete screen jacket change in little time.

TESTS on primary adjustments:
April 28, 1925.

	Washed coal ⅜" x 0" Percent Ash	Refuse Percent Float @ 1.40 Sp. Gr.
Table 1	3.05	8.5
Table 2	3.50	2.7
Table 3	2.90	3.9
Table 4	2.60	9.2
Average analysis	.... 3.01%	... 6.1%

Final tuning of tables
May 6, 1925.

	Washed coal ⅜" x 0"			Refuse	
	Percent Ash	Percent Float @ 1.40	Percent Sink @ 1.40	Percent Float @ 1.40	Percent Sink @ 1.40
Table 1	2.90	98.8	1.2	2.7	97.3
Table 2	2.75	99.2	.8	3.4	96.6
Table 3	2.50	98.5	1.5	1.8	98.2
Average results	2.72%	98.8%	1.7%	2.6%	97.4%

Results of washing ½" x 0" coal:
Average results of several tests:

Float in feed..... 80 percent — Ash, 17.3 percent Hd. Ash.
Float in washed coal..... 95 percent — Ash, 3.2 percent washed product.
Float in refuse..... 4 percent — Ash, 65.0 percent ash content of refuse.

Calculations of efficiency based on "Drakely's Formula."
Average results of several tests.

Float in feed..... 80 percent
Float in washed coal..... 95 percent
Float in refuse..... 4 percent

From the above:

$$\text{Percentage refuse} = 100 \times \frac{95 - 80}{95 - 4} = 16.5 \text{ percent.}$$

$$\text{Qualitative efficiency} = \frac{100 \times (95.0 - 80.0)}{100.0 - 80.0} = 75.0 \text{ percent}$$

$$\text{Quantitative efficiency} = \frac{100 \times (80.0 - (16.5 \times 4.0))}{80.0} = 99.2 \text{ percent.}$$

$$\text{General efficiency} = \frac{75.0 \times 99.2}{100} = 74.4 \text{ percent.}$$

Summary:

The qualitative efficiency (removal of total sink) is 75 percent.
The quantitative efficiency (recovery of total float) is 99.2 percent.
General efficiency of operation 74.4 percent.

Leahy Screens:

THE ½" x 0" raw coal to the tables is screened from the 1½" x 0" by two Leahy vibrating screens. This screen is suitable for screening either wet or dry material from 2½" in opening down to 100 mesh. It is built of all-steel, electric welded construction.

In sizing the material the screen jacket is vibrated by a connecting rod, this transmitting the special screening action. The jacket is free-swinging and vibrates over the entire surface without any flexing of the screen wires.

The bearings are subjected to balanced rotation at the low speed of 200 R.P.M., while producing 1,600 vibrations per minute.

Operation has demonstrated the following advantages:

(1) Rugged construction together with low upkeep cost and ability to give continuous service.

(3) High capacity brought about by this feature of differential vibration imparting to the screen 1,600 vibrations per minute and causing the undersize to be rapidly and efficiently screened through the openings.

(4) Elimination of high speed vibration, intermittent bearing pressure, and heavy wear and tear of the units.

(5) This screen has a greater capacity, although having less screen area, than screens of the shaking or revolving type which often have six times the screening area.

(6) Minimum amount of breakage of coal.

In conclusion one may state that by including this equipment into the general construction of the plant, a product results in the best condition for the market with minimum cost; the coordination of the various units allow continuous operation together with regularity of yields, and regularity of refuse disposal, which is after all the final test of good plant operation.

METAL-MINE VENTILATION in 1931*

By D. Harrington†

A YEAR of depression following another year of depression such as was 1931 is not likely to be one of progress in what is usually termed "welfare work," in which class metal-mine ventilation is usually placed. While accident occurrence was curbed to an unusual extent in both coal and metal mining, thus indicating that in this most important phase of so-called welfare work there was very definite progress in the depression year of 1931, nevertheless it is true that in so far as ventilation of metal mines is concerned, 1931 has contributed but little of benefit. However, there were some interesting occurrences affecting or being affected in some form or other by metal mine ventilation.

A relatively new type of mine fan built on the principle of the airplane propeller has made its appearance, and its proponents make some definite claims for it as against the centrifugal fans now in almost universal use; for example, it is said that the fan housing is cheaper and simpler; that the air current can be reversed in direction by reversing the direction of the fan by use of a simple switch; that fan driving by electric motor is done much more easily because of the high speed of the fan mechanism; and that the new fan is much more flexible in the matter of varying speed and air delivery.

In the *Engineering and Mining Journal* of October 26, 1931, was a short article about this type of fan from which the following abstract was taken:

The efficiency of the ordinary disk fan does not exceed 50 percent and with the Aerovane fan as appreciable power saving is made. Also the ordinary disk fan will not develop over 1-in. gage and be efficient, whereas the Aerovane fan will work up to 2-in. and more, depending altogether on the speed, and will be just as efficient at this duty as when operating on ½-in. gage. The fan also would replace many old wooden-housed centrifugal types because it is a fireproof equipment, whereas the other type of fan is a source of danger. Moreover, many large centrifugal fans of steel construction are operating on duties for which they were not designed or specified. Where large volumes against high gages are not required, this type of fan could be substituted to advantage.

A new Government constructed and operated vehicular tunnel in California is installing three of these new-type fans.

In previous business depressions during which metal mines were closed for considerable periods, much expense was incurred in resumption of operation because of timber decay and the resultant caving of overlying material; in many instances it was noticed that in the parts of mines in which there was good air circulation—usually this circulation was "natural" and hence just happened to occur——there was a minimum of this decay of timber. In some instances the operator was sufficiently keen to reason from these occurences that that mechanical or controlled ventilation might pay if used only to protect timbers in both working and idle periods, and some metal mine mechanical ventilation installations were made chiefly with this end in view. Whether mechanical ventilation was placed at metal mines for this or for some other reason or reasons, such installations have been found very beneficial in these times of financial stress, and numerous uses are being made of fan installations at metal mines.

Gases in Metal Mines

Metal mines continue to have difficulty in encountering various kinds of gassy conditions. A lead-silver mine in Utah in which a raise was driven into an abandoned stope liberated air deficient in oxygen and in the next shift one man was killed and 14 others overcome temporarily through breathing these gases; in another case in a Utah metal mine seven men were temporarily trapped by strata gases, but three walked out later on and the other four were assisted safely to the surface by men wearing oxygen-breathing apparatus. A shaft being sunk in another western state

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† Chief Engineer, safety division, U. S. Bureau of Mines.

for the purpose of mining potash encountered high-pressure gases containing considerable methane, the coal miner's explosive gas, and also containing appreciable amounts of the still more explosive hydrogen. The year 1931 increased the toll of deaths from rock-strata gases in the Cripple Creek, Colorado, region, where a mine foreman was killed by irrespirable gas upon going into the mine alone on a non-working day.

In driving a tunnel in a region in Colorado where hydrogen sulphide gas had caused so much difficulty in one mine that it was ultimately felt necessary to cease operating the mine, this odorous and dangerous gas was found at the tunnel face, but ventilation was kept well in effect so the underground workers should not become disaffected through memories of the past difficulties from this gas in the mine which was abandoned. In connection with encountering air with oxygen below the normal air percentage of 20.9 (and very frequently metal mine workers are forced to use air with oxygen much below that percentage) the following quotation taken from the July 25, 1931, *Science News Letter* is of interest:

> For the characteristic effects which come from breathing air containing too little oxygen have recently been found to be very much like those which come from taking too much alcohol. And, except for the fact that they are temporary, they are significantly similar to the symptoms of that type of insanity known to physicians as dementia praecox.

It would appear that much remains to be done in trying to arrive at definite information as to what constitutes "*bad air*" in mines; considerable information is available as to the effect of poisonous gases such as carbon monoxide, hydrogen sulphide, sulphur dioxide, and similar gases which are at times encountered in mines, but relatively little of a definite nature is known as to the effect on underground workers of such small percentages of carbon dioxide as 1, 2, or 3 percent, or of deficiency of oxygen of 1, 2, or more percent to as much as 10 or more percent. Many underground workers breathe an atmosphere containing 1 or 2 percent carbon dioxide and oxygen as low as 18 or 19 or even as low as 15 or 16 percent; certainly there is some point at which atmospheres made defective by high CO_2 or nitrogen or low oxygen or combinations of these have slightly harmful effects on health and on efficiency, another point at which the harm becomes dangerous, and another at which death intervenes, as we know that some of these atmospheres containing an abnormal percentage of oxygen, nitrogen, and carbon dioxide (high with carbon dioxide and nitrogen, low with oxygen) cause comparatively quick death.

Temperature and Humidity in Mines

From South Africa come the announcements that plans are being made to operate at vertical depths of around or below 8,500 feet from the surface; that rock temperatures at a depth of 8,010 are 101.2° F.; that air temperatures in the stopes at these levels are from 94 to 96° F., the relative humidity 85 to 95 percent, and that of the approximately 10,000 men working under such atmospheric conditions during a 12-month period, 12 were overcome by heat stroke, six dying; it has been shown that normally a period of about four days' continuous work at a reduced output in a hot place is sufficient for the new worker to become acclimatized to producing a full output of work in the same condition; and it is announced that the critical heat point for man lies at an air temperature of about 90° F., wet bulb in the presence of appreciable air-movement. One article (in *The Colliery Guardian* of August 14, 1931) on mine ventilation and cooling mine air (with especial reference to the Rand) says:

> No method of air conditioning in mining yet proposed, other than that of pure ventilation, would appear to take the same economical return from the underground heat, although it might appear that surface refrigeration of the ventilating air would enhance the gain from underground heat. Actually, the cost of a surface refrigerating plant to deal with the ventilating air of a Rand mine is out of all proportion to the advantages accruing, and is, therefore, entirely prohibitive from an economical standpoint.

Dust and Health in Mines

The various problems practically always existent in connection with dust occurrence in mines continue to occupy much attention of the mining public, technical press, and even the general public.

Several kinds of equipment have been brought forward in the United States and elsewhere with the idea of removing dust from the surrounding air due to the operation of compressed air drills; while some of these devices may be applicable to surface drilling operations, none as yet appear applicable to drilling in mines. There has been much written about silicosis during the past year, and it looks more and more as though ill health due to dust inhalation will be made compensable in a number of the states of the United States. That this will constitute a real problem to many of our mines may be inferred from the fact that according to an item in the March, 1931, *Monthly Labor Review* of the U. S. Department of Labor from April 12, 1911, to March 31, 1929, a total of 14,767 persons had received awards from South African mines for silicosis, tuberculosis, or silicosis and tuberculosis combined, the total amount of these awards being $48,505,520.

Ontario made silicosis compensable a few years ago, and in 1931 a very drastic compensation law was made effective in Mexico, one of the most far reaching of its provisions being in connection with occupational diseases, of which not only silicosis but also other dust diseases were made compensable. While compensation for occupational disease has been resisted fairly successfully in the United States some states have made such provision; and whether one likes it or not, common sense demands that if an occupation causes disease, the industry or the general public—at any rate not the victim—should shoulder the burden. And when occupational disease due to dust is taken into consideration, the sooner it is recognized that the breathing of large quantities of any kind of dust over considerable continuous periods is unhealthful, the sooner will the real solution of the problem be reached. And while numerous remedial or preventive measures will be advanced with a view to minimizing disease from dust inhalation, it is probable that the most effective of these, at least in so far as mining is concerned, will be adequate ventilation.

Much has been written (and mostly of a nonsensical nature) about the ills to which the underground worker is subjected due to being deprived of his quota of sunlight. Possibly, however, there may be some merit in the suggestion that the underground worker be provided some artificial means of securing the benefits supposed to accrue through contact with the rays of the sun. The Bunker Hill and Sullivan Mining and Concentrating Co., of Kellogg, Idaho, in 1929, installed "*an automatic solarium* or artificial sunlight machine capable of treating 300 to 350 cases per hour." An article on "Industrial Welfare" in THE MINING CONGRESS JOURNAL of November, 1931, describes some features of the installation; the following paragraph being taken from the article:

> It is difficult to determine just what benefits have been derived by those persons taking the treatments, but it is the opinion of the hospital staff that resistance to colds, disease, and a decrease in rundown conditions are greater among those who have consistently taken the treatments. An example which may be cited, but which is not necessarily conclusive, is the record of pneumonia cases among employes during 1930. Of the total number of these cases, 37.5 per cent had taken sunshine treatments and 66.6 per cent of these patients recovered, whereas the total fatality was 62.5 percent. In another case, a girl gained 17 pounds in weight during a period of one year, where (*Continued on page* 31)

NEWS
of the mining field

Soft Coal Producers to Proceed With New Sales Organization

"We are going to perfect our organization and then let the Government sue us to determine whether we are a combine in restraint of trade or not. We maintain that our organization is a central coal sales agency and not a monopoly, as we shall compete with coal operators in our region not included in our association, and also with coal operators of Pennsylvania, Ohio, Illinois, Alabama, northern West Virginia and other regions," stated C. C. Dickinson, Charleston, W. Va., chairman of the organization committee of the stockholders of Appalachian Coals, Incorporated, holding an all-day session at the Hotel Sinton-St. Nicholas, Cincinnati. About 50 stockholders attended. They were checking up subscriptions of the various mining operators in the high volatile coal fields of Kentucky, West Virginia, Southwest Virginia and Tennessee, which constitutes the region included in the sales agency.

W. J. Magee, Cincinnati, and Mr. Dickinson are among those mentioned for president. Edward Howe, Knoxville, is secretary of the organization committee.

Phelps Dodge Copper Products Corporation Formed

Louis S. Cates, president of Phelps Dodge Corporation, announced that the manufacturing business of that company will, on and after March 21, be conducted by two separate subsidiary corporations.

A new corporation, named Phelps Dodge Copper Products Corporation, which will be headed by Wylie Brown as president, will take over and operate the other fabricating divisions of the company's business.

Ohio Mine Safety Campaign Started

The Ohio Division of Mines, in conjunction with the State Industrial Commission, is sponsoring a three months' mine safety compaign to reduce accidents. At the beginning of the contest, 76 companies employing 13,038 men had enrolled and others were coming in. The rules governing the contest divide the mines of the state into three classes: Coal mines, clay mines, and miscellaneous. These are divided into four groups as follows: No. 1, employing 20 men or less; No. 2, 20 to 100 men; No. 3, 100 to 300 men, and No. 4, employing over 300 men.

SAFETY NOTES——

There were 106 fatalities in the coal mines of Kentucky during 1931, as compared with 181 in 1930, according to the State Department of Mines.

The coal mines of Alabama mined 220,000 tons more per fatality in 1931 than in the previous year. The 1931 output was approximately 12,250,000 tons with 26 fatalities (475,000 tons per fatality), while the production in 1930 totaled 16,007,405 tons with 61 deaths, or 255,000 tons mined per fatality. The De Bardeleben Coal Corporation, with a production of 800,000 tons, went through 1931 without a fatality. Tennessee Coal, Iron & Railroad Company produced 1,750,000 tons with but 1 fatality.

There were six fatal accidents in Maryland coal mines in 1931, all due to falls of roof, according to Dr. J. J. Rutledge, chief of the State Bureau of Mines.

During 1931 the United States Fuel Company, Salt Lake City, working an average of about 500 men, produced more than 500,000 tons of coal without a fatal accident, and with only 27 lost-time accidents. The company has now mined more than 1,000,000 tons since the last fatality. The Panther mine has a clear record since 1925; the King mine No. 2 since November, 1929; and the King mine No. 1 has had a clean clate for 22 months.

The iron mines of Itasca County, Minn., operated the entire year 1931 without a fatal accident. In addition, there has been no fatal accident in the county since September, 1930, either in the open pits or underground. The mines of Itasca County are those on the western end of the Mesabi Range.

There were 16 fatal accidents in the mines of Arizona for the year 1931 and 191 serious accidents, according to the report of the State mine inspector. There were 4,325 men employed underground at the last inspection before the close of the year, and 2,615 were working at mine surface plants.

Sunrise Coal Co. Buys Scott's Run

The Sunrise Coal Company has purchased the Scott's Run Fuel Company from the receiver for the closed bank of Monongahela Valley, according to announcement by Frank C. Shriver, of Morgantown, W. Va., president of the Sunrise Company. The property purchased is the Jere Mine in Monongalia County, with about 420 acres of coal land. It is understood that operation will be started as soon as the mine can be put into shape.

Two-Year Suspension of Anti-Trust Laws Proposed

A two-year truce in the anti-trust laws was proposed to President Hoover recently by Charles F. Abbott, of New York, executive director of the American Institute of Steel Construction. At least a temporary modification is imperative, Mr. Abbott declared, in order to permit the formation of trade associations to stabilize business conditions for small concerns. Otherwise, he said, failure may impend for thousands of large and small business organizations scattered throughout the country.

The Supreme Court declined to review an appeal of the Argonaut Consolidated Mining Company from a decision of the Second Circuit Court of Appeals in favor of the Internal Revenue Bureau, in which the company sought a refund of capital stock taxes paid from 1922 to 1926. The company claimed exemption as a holding company and also attacked the bureau's method of valuing mining shares held by the company as a stockholder on the basis of the depletion value formula used in valuing mining property on computations as of March 1, 1913.

Mining Section News Letter

The twenty-first Annual Safety Congress of the National Safety Council will be held in Washington, D. C., October 3 to 7.

The Government has an estimated total of a billion and a half tons of coal valued at from $2.25 to $2.50 per acre in 16,911 acres in the Uintah National Forest in Utah, according to a report of the Interior Department to Congress based on a classification of the Geological Survey. The lands formerly belonged to the Uintah, White River and Uncompahgre bands of Ute Indians. The low value of the coal is based on its adverse natural conditions, including steep dips, difficulty of access, low quality, and absence of market, with a probability that it will not be mined within the next 200 years.

"On the basis of existing coal regulations, the present worth of the coal lands for immediate development if a railroad was within 15 miles of the area, is $107 an acre," says the departmental report. "Immediate development is out of the question as the nearest railroad is 63 miles distant and sites for development are not reached by permanent wagon roads."

Personals——

At the annual meeting of the Tungsten Mines, Inc., held in Spokane recently, the following directors were elected: James Lefevre, president; W. G. Reed, vice president; C. W. Watt, secretary-treasurer; J. P. Reed and R. J. Weller, managers. Mr. Lefevre and Mr. Weller are of this city, and the others of Stevens county, in which the mine is situated.

✣

At the annual meeting and banquet of the Columbia section, American Institute of Mining and Metallurgical Engineers, in Spokane last week, Robert T. Banks was elected chairman; Frederic Keefer, vice chairman, and L. K. Armstrong, secretary-treasurer. With the past chairman, Wallace G. Woolf, of Kellogg, Idaho, they named H. E. Culver, state supervisor of geology and professor of geology at Washington State College, as the fifth member of the board.

✣

A. B. YOUNG, metallurgical engineer of Salt Lake City, spent several weeks in the east, and on January 20 testified before the subcommittee of the House of Representatives on silver stabilization.

✣

A. G. MACKENZIE, of Salt Lake City, secretary of the Utah Chapter of the American Mining Congress, was in Washington on business in connection with the work of the Utah Chapter.

✣

EDWIN C. JONES, formerly chief chemist for the Oliver Iron Mining Company, has been made assistant superintendent of the Ely District on the Vermillion iron range, Minnesota.

✣

GEORGE J. STEINHEISER, of Helvetia, Pa., has been appointed as a bituminous coal mine inspector of Pennsylvania, succeeding Thomas H. Thompson, who resigned.

✣

GEORGE J. EISELE has been appointed general superintendent for mines of the Marquette and Menominee districts, Michigan, Oliver Iron Mining Company, according to an announcement by LeRoy Salsich, president.

Pickands, Mather Acquires Pickands, Brown & Company

Pickands, Mather & Company has acquired the pig iron and coke sales business of Pickands, Brown & Company, of Chicago. The two firms have been closely related for many years. They joined interests soon after the organization of both firms in 1883 but in 1900 separated. Four members of Pickands, Brown & Company have become members of the firm of Pickands, Mather & Company. They are C. P. Wheeler, former president; Seymour Wheeler, former vice president, in charge of pig iron sales; Donald Boynton, former vice president, in charge of coke sales; and Clifford D. Caldwell, former vice president and president of Interlake Iron Corporation.

The Interstate Commerce Commission reports that there is a truck movement of 400,000 tons of coal annually from mines in Pennsylvania to destinations within a radius of 50 miles of the mines. This coal, it says, can be delivered to consumers' bins in this area at from $1 to $2 per ton less than the retail prices of dealers using rail transportation. The movement of coal by motor truck from Illinois mines to St. Louis in 1930 is said to have amounted to 500,000 tons, and that trucks available for this service at St. Louis can handle 10,000 tons of coal a day from Illinois mines. It also states there is a substantial movement of ex-lake coal from lake ports to destinations within a radius of 150 miles by truck.

FREIGHT RATES——

Fuel Consumption of Roads Studied

Railroad practices in the selection of fuel, as well as prices and other matters relating to fuel consumption, will form the next part of the Interstate Commerce Commission's general inquiry into rail practices affecting revenues and expenses, it was announced recently. Shortly after the roads of the country asked the Commission for a 15 percent increase in all freight rates, the Commission institutes its inquiry to determine what changes, if any, should be made in rail operations to cut down expenses.

BOOK REVIEW

FLOTATION, *by A. M. Gaudin. McGraw-Hill Book Company, New York,* 1932; 552 *pages; price,* $6.

FLOTATION is a book which should be useful to student, mill-worker, research man, metallurgist, and engineer. Until this work appeared, those men interested in concentration by flotation had to depend mainly on Weinig and Palmer's "The Trend of Flotation" (three good editions) and Taggart's "Handbook of Ore-Dressing," also on a scattered literature on the subject. Gaudin covers the fundamentals and latest practice within 552 pages, and embodies 388 references, including patents. A surprisingly large number of the papers listed have been published within the last six years; two not listed appeared early in 1932.

Flotation as an ore-dressing process has had, like cyanidation, a great effect on the mining and metallurgy of ores and the markets for the metals extracted therefrom. Its importance is concisely yet rather too briefly covered in the last chapter. The reviewer, who has watched the flotation of lead-zinc ore at Broken Hill, Australia, and at Midvale, Utah, and copper ore at Magna and copper-lead ore at Bingham Canyon, Utah, knows Gaudin and his research on flotation, and is pleased to note the practical nature of the book.

Flotation mostly covers North American practice; but additional matter on African, Australian, Burma, and Mexican operations would not have extended many pages. Broken Hill, where practical flotation had its inception and from where many improvements have come, is dismissed in a few lines; so is the work on gold-antimony-arsenic ore at Wiluna, Western Australia, where a plant is now treating 1,000 tons a day. The only other criticism is that more cross-indexing could have been done.

The history of flotation Gaudin covers in eight pages. He lists those men who were responsible for the important steps in evolution of the process, early practice and recent trends. . . . Atoms and molecules, ions and polarity, surface reactions, adsorption, monomolecular films, and catalysis are discussed as the physicochemical foundations of flotation. . . . The phases in flotation are the gaseous, liquid, and solid. Under the last mentioned come polarity and floatability which include contact angle. . . . Colloids are described and considered. . . . Flotation reagents consumed in 268 plants which treated 65,400,000 tons of ores in 1929 averaged 4.275 pounds per ton, according to the United States Bureau of Mines. Some are frothers, some are collectors, some are activators, some are sulphidizers, and some are depressors. Chapter V covers these. . . . This is followed by the mechanics of froth flotation. . . . The crushing of ores and liberation of minerals and particle size are of importance in flotation and are well discussed. . . . If anyone wants to know how to float sulphide ores of copper, lead-zinc, copper-zinc, copper-lead, copper-nickel; the oxidized ores of copper, lead, and zinc; precious and rare metals; and non-metallic minerals, he will find practice described in Chapters VIII to XIII, a total of 230 pages—a valuable review. . . . The machinery used and some pointers on mill design receive adequate treatment. . . . The elements of costs, with actual costs, is a useful chapter. . . . And the economics in the choice of ore-treatment method, followed by suitable testing and testing equipment complete the best picture of the important art of flotation.

M. W. VON BERNEWITZ.

Recent Publications of the U. S. Bureau of Mines

Roof Support in Coal Mines in Irwin, Greensburg and Latrobe Basins, Westmoreland County, Pa. (R. I. 3113).

Cooperative Research Between U. S. Bureau of Mines and British Safety in Mines Research Board (R. I. 3117).

Comparison of Storage Battery and Cable-Reel Gathering Locomotives in a West Virginia Mine (R. I. 3121).

Tests on Brick Kilns Fired with a Stoker (R. I. 3122).

Experiments to Determine the Minimum Amount of Coal Dust Required for Propagation of a Mine Explosion (R. I. 3132).

Acidity of Several Pennsylvania Streams During Low Water (R. I. 3119).

Lost-Time Accidents in Some Alabama Coal and Iron Mines During 1930 (I. C. 6506).

Permissible Explosives and Blasting Devices Approved Prior to June 30, 1931 (R. I. 3134).

With the MANUFACTURERS

Thyratron Tubes to Govern Speed of Intermittent Line and Spot Welding

Close and accurate control of the frequency of current interruption in line welding, and an increase in speed of interruption up to 1,800 per minute, are among the advantages of a new type of Thyratron tube timing control announced by the General Electric Company. The new control replaces mechanical interrupters. The equipment operates in synchronism with the alternating current supply of the welding machine. The new synchronous tube timer supplements, and is designed to work in conjunction with, the General Electric welding control type CR 7503 recently announced.

"G-E Fabroil Gears & Gear Blanks" and "G-E Textolite Gears & Gear Blanks" are the titles of bulletins published by the General Electric Plastics Department descriptive of two materials developed for use where non-metallic gears are desired.

Gearmotors, consisting of speed reducers compactly combined with induction motors into general purpose unit drives, are the subject of a new publication, Leaflet 20,536, issued by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

New Hand Lamp and Portable Searchlight

Two useful additions to the line of the Edison electric lamps are announced by the Mine Safety Appliances Company, of Pittsburgh, Pa. The Edison permissible hand lamp is made in two models, developing 350 and 600 beam candle power, respectively, when equipped with polished reflectors. When a spread of light is required a matte surface reflector is substituted.

The M. S. A. portable floodlight is also made in two sizes using six or four type M-14 Edison cells. They are provided in both permissible and non-permissible form. These models can, by changing reflectors as on the hand lamps, be changed from a floodlight with a fairly wide angle to a search lamp casting a narrow and powerful beam, particularly valuable for such tasks as lining up track underground. As floodlights they are especially useful for illuminating coal or metal mines at the face. These lamps weigh 16½ and 17½ pounds each, and are each capable of 400 beam candle power with matte reflectors or 3,000 beam candle power with the polished reflector.

New G. E. Floodlight

A new and larger handy floodlight, the "Senior," designed for general utility floodlighting and employing a 200-watt incandescent lamp has been announced by the General Electric Company.

"Direct Mounted Pumps," a bulletin just issued by the LaBour Company, of Elkhart, Ind. The compactness and simplicity, the basic operating principle and practical applications of these self-priming centrifugal pumps are described. These pumps are especially applicable where it is desired to locate the pump above the source of liquid supply. Installations described include sump and drainage work, contractor's service, ice and refrigerating plants, swimming pools and bilge service.

"Zeiss-Dywidag" is the title of a booklet issued by the Roberts and Schaefer Company, Wrigley Building, Chicago. It contains the outline of the new principle of concrete construction (described more fully in our January issue) of thin, reinforced roofs of huge span. There are many European installations pictured that include large warehouses, airplane hangers, dock sheds, gymnasium roofs and bridges.

"Evolution of Mining Practice During the Middle Ages," is the title of an interesting booklet recently published by the American Cast Iron Company, of Birmingham, Ala. Most of the illustrations are taken from "The Treatise of Agricola." The booklet also features the advantages of the cast iron and cement lined pipe with the Simplex Joint produced by this company.

Another booklet of value to engineers, which, like the above, will be sent upon request, from the American Cast Iron Pipe Company "Acipo Cement Lined Cast Iron Pipe" describes the advantages and construction of this kind of pipe. It also contains a table of adjusted values of "C" applicable to Williams' & Hazen's Hydraulic Tables for use in figuring an economical cement-lined pipe installation.

Westinghouse Announces New Magnetic Control

The Westinghouse Company announces a new line of D. C. magnetic starters designed especially for mining service.

E. D. Bullard Co., manufacturers of safety equipment, announce the new Bullard gas mask for industrial use. The Bullard gas mask is made with a one-piece moulded face piece, scientifically shaped to conform to any wearer's face. The face piece is held in place by means of light weight rubber straps which operate on an entirely new principle of suspension. Instead of requiring tension which holds the face piece tightly against the face, the moulded face piece on the Bullard mask is suspended from the top of the head and held snugly in place by straps which run around the head with a minimum tension.

The rubber straps used to support the face piece are adjusted as an ordinary belt, and once the adjustment is made it is permanent. A special neck snap permits quick and easy removal of the face piece.

The rubber used in the face piece is specially compounded and will not oxidize or lose its elasticity.

Anti-Friction Bearings Locomotive Completes 100,000 Miles

What is described as the first locomotive ever completely equipped with anti-friction bearings has recently completed its initial test period of 100,000 miles. This engine, equipped with Timken tapered roller bearings in all axles—engine truck, driver axles, trailer truck and tender trucks—operated from coast to coast under all conditions, hauling the heaviest freight and fastest passenger trains.

No bearings trouble developed, thus assuring the maintenance economy of the bearings. Superior starting ability was demonstrated both on level track and on severe grades, and high speeds were attained in passenger service.

"Coal Cleaning by the Norton Automatic System" is the title of a booklet published by the McNally-Pittsburg Manufacturing Corporation of Pittsburg, Kans. The American rights for the Norton system have been acquired by this company. This system, developed in England, is described as being fully automatic and accurate in operation. The booklet is well illustrated with diagrams and photographs.

(*From page 27*)

her normal yearly gain previous to taking treatments was about 1 pound.

More recently the McIntyre Mine, at Schumaker, Ontario, has installed a solarium for the benefit of its workers.

Fires and Fire Prevention and Fire Fighting

In so far as information is available the year 1931 was without loss of life in fires in or around metal mines though 11 persons died in a fire in a tunnel being driven in Chicago. There were however several fires in and around metal mines in which property loss was heavy. Rather curiously most of the fires in 1931 at metal mines which for a time endangered life were in surface buildings, and at least three of them were reported as due to forest fires; this brings to attention the numerous hazards in flammable surface structures at mines and the desirability of keeping grass, brush and other rubbish well cleared away from mine portals, whether shafts, inclines or tunnels. Moreover, all mines should by all means have adequate fire doors in place at all openings, and precautions should be taken to insure their being in working order and being located so they may be closed or opened as needed at time of emergency.

The following item taken from the May, 1931, Bulletin of the California State Department of Industrial Relations shows that the State of California is trying to "get right" on at least one item safeguarding its citizens from conflagrations. The mining industry, both coal mining and metal mining, has a similar duty towards its workers in that many mines have *no* fire fighting or fire prevention measures and many others have nondescript equipment, much of which would be useless at time of emergency.

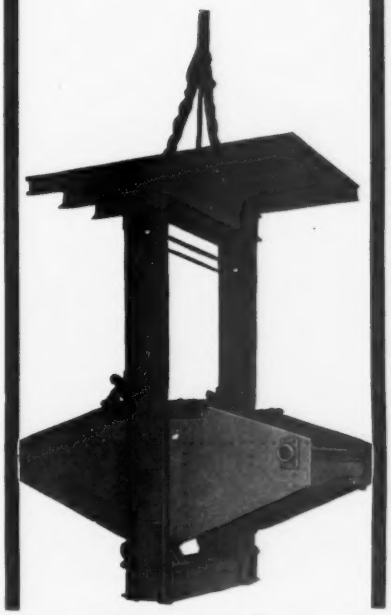
1. The California Legislature has passed Assembly bill No. 734, which requires the standardization of existing hydrant and fire hose coupling threads. It makes unlawful the sale of such equipment having other than "National Standard" threads. There are at present some nine varying threads, which preclude the concerted operation of fire departments of different communities in rendering assistance to one another in case of a majority conflagration. The bill provides that the standardization is to be done over a period of five years by or under the direction of the state fire marshal (chief of the Division of Fire Safety in the Department of Industrial Relations).

2. Disastrous fires, both in California and elsewhere, preach telling sermons in favor of Assembly bill No. 734. The famous Baltimore fire of 1904 necessitated calling for help from the departments of New York, Philadelphia and Washington. When the men arrived with their trucks and equipment, it was found to be impossible to function, because the fire hose of the other cities had a different thread from that used in Baltimore. Therefore the expert aid needed in the time of great emergency was lacking. Millions of dollars of property was lost, lives were in jeopardy, and confusion was accentuated as an outcome of what would seem to many to be the lack of that uncommon common sense which plans for the days ahead.

The subject of spontaneous fires was treated in a popular fashion in an article entitled "Mystery Fires," which appeared in the Saturday Evening Post of August 29, 1931. The article was well worth the careful perusal of all persons engaged in any kind of mining, as well as of the householder for whose especial benefit it evidently was written. The following paragraph was taken from the article:

But there are other elements which perform such surprising antics under equally innocent conditions. Metals, for instance, which we popularly consider incombustible, frequently offer a fire hazard when finely divided or, in other words, when in powder form. Aluminum, zinc, copper, iron, bronze and other powders will often ignite spontaneously upon contact with water. And in the chemical field (*Continued on page 33*)

HOLMES



CAGES for fast hoisting

Holmes all steel cages are giving uninterrupted, rapid and efficient service at many mines. Quick and easy dumping action. Many extra safety devices included in their design.

The unusual design and construction of these cages is described in our Bulletin 52. Let us send it.

HOLMES equipment includes Sheaves, Electric Car Retarders, Coal Lowering Spirals and Compiets Tipples.

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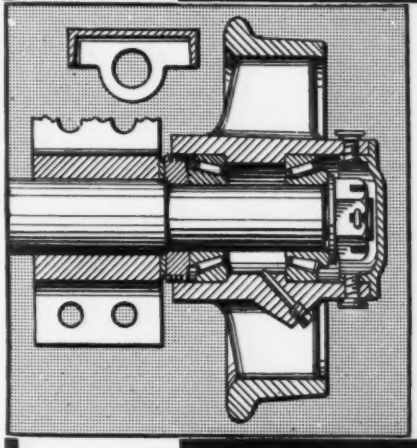

EGYPTIAN MINE-CAR WHEELS WITH TIMKEN ROLLER-BEARINGS ELIMINATE ALL WEAR ON AXLES, ARE ADJUSTABLE, AND SAVE LUBRICANT, POWER, AND MAINTENANCE

SEND FOR DESCRIPTIVE BOOKLET

EGYPTIAN IRON WORKS
MURPHYSBORO · ILLINOIS

New Jeffrey Equipment Described

The Jeffrey Manufacturing Company, Columbus, Ohio, has issued several illustrated folders covering Jeffrey mining equipment, descriptions of which are given below. Copies may be had upon request.

Jeffrey A-6 Drill.—A low cost, light weight, high speed post drill, entirely new in design and construction, built in open and permissible types.

Automatic Transfer Switch for Gathering Locomotive Service.—This Jeffrey switch has come into general use in all types of gathering locomotives for transferring automatically from trolley circuit to cable reel circuit.

Continuous Steel Strip Resistance.—Designed particularly to withstand the hard knocks encountered in mining service. Non-oxidizing high-resistance steel of uniform cross-section wound in a continuous strip.

Trolleys for Mine Locomotives.—Harps and sockets, trolley wheels, trolley base, pantograph trolleys, for all types or makes of locomotives.

Removable Split Rim Gears.—Gear rims for locomotives replaced without removing wheels or trucks. Consists of gear center, two rim halves and special hexagonal head bolts.

Standard Controllers for Mine Locomotive Service.—Designed for large current carrying capacity. Clamp terminals, heavy construction and ample arcing space.

New Purox Welding Torch and Cutting Attachment

The Linde Air Products Company has recently made two new additions to its line of Purox medium pressure apparatus for oxy-acetylene welding and cutting.

The new Purox No. 11 welding torch has a very wide welding range extending from the lightest sheet metal up to work as heavy as ½-in. plate. It is light in weight, has perfect balance, and the tips are of one-piece, hard-drawn copper construction, so designed that the head angle can be easily adjusted as desired by the user.

The Purox No. 21 cutting attachment, designed for use with the Purox No. 11 Welding Torch will cut metal up to 2 in. in thickness. It is furnished with one-and two-piece Purox cutting tips. By means of this cutting attachment the welding torch can be easily and quickly converted into a cutting torch. This is the lightest cutting attachment on the market, weighing only 1 lb. 8 ozs. An adaptor is also available which makes it possible to use the Purox No. 21 cutting attachment with the Purox No. 20 welding torch.

The Central Foundry Company, Graybar Building, New York, have published an illustrated folder on their universal dual-lok joint cast iron pipe for gas, coal and industrial purposes. Advantages described include flexibility of the pipe line, a non-deteriorating gasket that gives an increasingly tighter joint with increased pressure, double protection against leakage and simplicity and economy of installation.

An unusual booklet has been prepared by the Hercules Powder Company, of Wilmington, Del., descriptive of their newly opened experiment station and research laboratories. It is beautifully illustrated with photographs of laboratories, experiments, microphotographs and gives an idea of the research facilities and many activities of this company's technical service.

CONNELLSVILLE

CONNELLSVILLE Sheaves have great strength and elasticity. They withstand heavy loads, shocks and stresses Hub, spokes and main rim are cast in one piece. A hard, locomotive tire steel ring, made IN ONE PIECE fits over a turned position of the rim. A follower, bolted to the main rim, holds this ring in place. This sheave, under unusually hard service, will give 8 to 10 years of service. Steel rope will not cut or rough them. Rope will last longer than on soft steel or cast iron groove.

Bearings are weather proof, oil proof and collar oiling, with removable babbitted shell. Dirt and moisture are excluded. There is flood lubrication of all parts under all conditions. Their superiority has been proven under the worst possible climatic conditions. Send for details of this or any other type of mining machinery.

THE CONNELLSVILLE MFG. & MINE SUPPLY CO.
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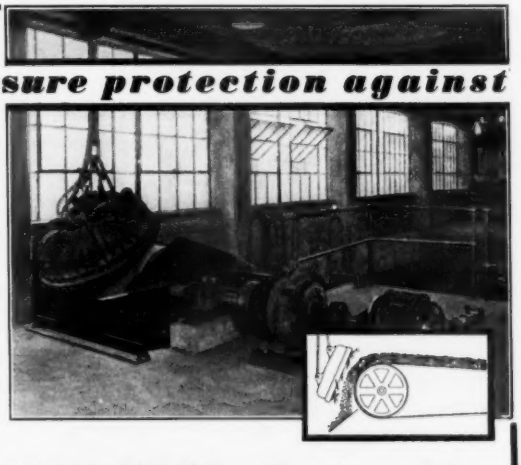

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Please send SEPARATOR MAGNET Bulletin

NAME .....
ADDRESS .....

(From page 31)

there are many elements, such as magnesium, potassium and sodium, that will explode when water touches them, and others, such as nitric and sulphuric acids, which may cause fire upon mere contact with some combustible material.

New Record for Railroad Fuel Economy

Railroads of this country in the first six months of 1931 established a new record for efficiency in the use of fuel by road locomotives, according to reports filed by the railroads with the Interstate Commerce Commission.

An average of 122 lbs. of fuel was required during the first six months of 1931 to haul 1,000 tons of freight and equipment, including locomotive and tender, a distance of one mile. This average was the lowest ever attained for any corresponding period by the railroads since the compilation of these reports began in 1918, being a reduction of three pounds under the best previous record established in the first half of 1930.

The railroads also attained a new efficiency record in the use of fuel in the passenger service for the first six months of 1931. For that period an average of 14 4/5 pounds was required to move each passenger train car one mile compared with 15 lbs. in the first half of the preceding year.

Class I railroads in the first half of 1931 used for locomotive fuel 42,672,474 tons of coal and 1,012,932,384 gallons of fuel oil.

An ingenious mechanism for weighing and recording materials in transit on conveyor or feeder scales, employing the photo-electric or light-sensitive cell, has been developed by John Chatillon & Sons, of New York, in conjunction with the Burgess Battery Company. The device, known as the telepoise, works on the simple idea of interrupting a light beam a varying number of times depending on the momentary weight passing over a scale section, and converting the light impulses into corresponding electrical impulses for the actuation of an electric counter.

Bulletin No. 1240 of the Atlas Car & Manufacturing Company, of Cleveland, Ohio, is a profusely illustrated catalogue showing the wide diversity of cars, locomotives, haulage and handing equipment produced by this firm.

Chance Coal Cleaner, manufacturers of the sand flotation process for cleaning coal have appointed Arthur G. McKee & Company, of Cleveland, as sole licensor for the States of Indiana, Illinois, Kentucky, Tennessee and Alabama.

New Marion Gas Shovel

The Marion Steam Shovel Company, Marion, Ohio, has announced a new ½-cu. yd. shovel, dragline, clamshell and crane, named "Type 120." It is a gas machine designed for small general excavating and material-handling work.

"This new model is fast and mobile," states J. H. Watters, president of the company. "It is simple to a high degree, thoroughly accessible, and has the fewest number of parts possible.

"Type 120 incorporates a number of unique features, including a rotating gear as large as the overall width of the crawlers, centralized machinery mounting, ball-bearing roller path, and high ground clearance combined with unusual compactness."

Nearly fifty years ago, the Marion Company built one of the very first steam shovels; ten years ago, introduced the three-motor-drive principle; and two years ago erected the world's largest shovel, a 20-cu. yd. capacity electric, operating in the Illinois strip coal fields.

The annual meeting of the Mine Inspectors Institute of America will be held May 9, 10 and 11 at the Mallow-Sterling Hotel, Wilkes-Barre, Pa. C. A. McDowell, safety and personnel manager of the Pittsburgh Coal Co., Box 64, Pittsburgh, Pa., is secretary.

Where switch stands are not used

Patented

Where switch stands are not used with room switches these Kick Switch Plates help to move the switch into and hold it in correct position. Sloping surface prevents points jarring open. From the simplest equipment to the most elaborate West Virginia offers many unique advantages such as this. All are graphically described in our new Catalog "C." Let us send it—it is full of useful suggestions.

THE WEST VIRGINIA RAIL COMPANY

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Rails and Accessories, Frogs, Switches, Steel Ties and Special Track Work in stock for prompt shipment.

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Write for Bulletin

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This 30 H.S.P.* Loader whips out high tonnages from low coal

THIS MACHINE, 40 inches high, whips out from the cramped conditions of low seams a high average tonnage as economically as the standard 5 BU Joy Loader. It can load two or more tons per minute and, under general conditions, can maintain high tonnage per man day in thin coal as compared with efficiencies of the 5 BU in thick coal. One man controls all operations. This loader is flexible. It travels on and off track and moves easily from place to place under its own power. Joy Loaders continue to load the highest percentage of all mechanically mined coal. The reason for this record lies in their adaptability to most mining systems and in the proven fitness of the design and construction of the machine for its job. Let us estimate the possibilities of Joy savings at your mine. No obligation to you.

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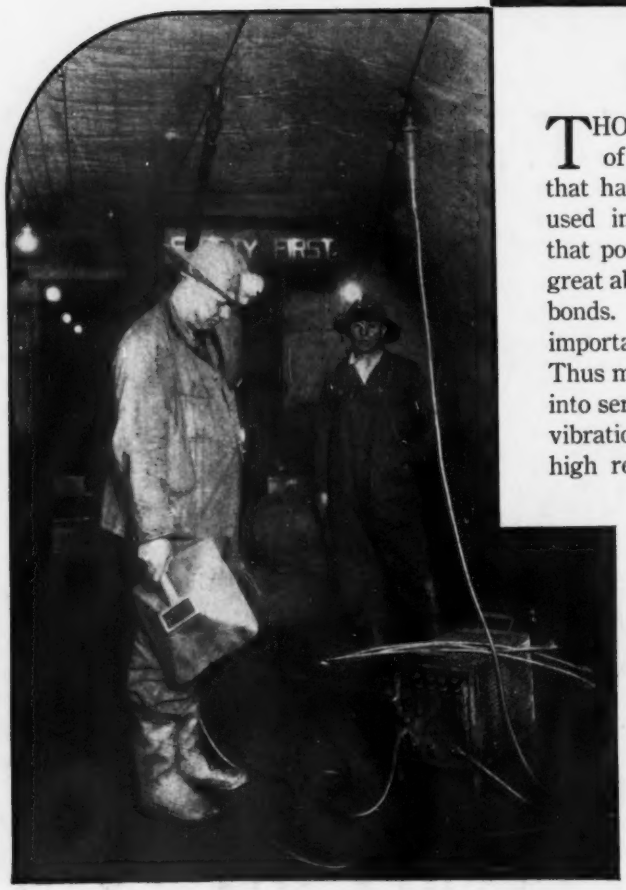
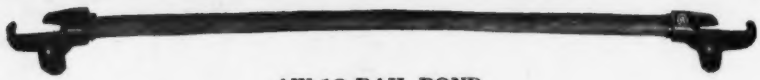
*Hand-Shovel Power

WHAT THE EXPERIENCE OF PROFIT-MAKERS INDICATES "



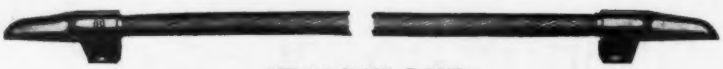
THOSE who make the most of the profit-possibilities of electrical haulage are firm in their conviction that haulage is no more dependable than the materials used in the electrification. Their experience indicates that poor materials rob the electrical haulageway of its great ability to cut costs. This is particularly true of rail bonds. To eyes untrained in recognizing the small but important features, all rail bonds are apt to look alike. Thus many bonds other than good bonds find their way into service. Then come the stresses of wear, tear, and vibration. The continued failure of such bonds establishes high resistance in return circuits, and results in long continued, and frequently very high, power losses.

To provide bonds having long mechanical life and low continued resistance, O-B is continually carrying forward the work of bond improvement. The internal copper sleeve which absorbs track vibrations; the special left concentric lay of the cable which keeps the strands tight; the terminal design, these are some of the more obvious O-B bond improvements which contribute toward the splendid and full cost-reducing possibilities of electrical haulage and rail bonds.



AW-12 RAIL BOND

A bond famous for its ease of application and long life. Applied by the copper metallic-arc weld process. Completely described, page 670, O-B Catalog No. 20.



AW-13 RAIL BOND

The "ace" of steel metallic-arc weld process bonds. Complete information and catalog numbers are given on page 671, O-B Catalog No. 20.

1403M

OHIO BRASS COMPANY

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